April 1983
vol 9, no 4
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Short Circuit Awards: The Best And The Worst

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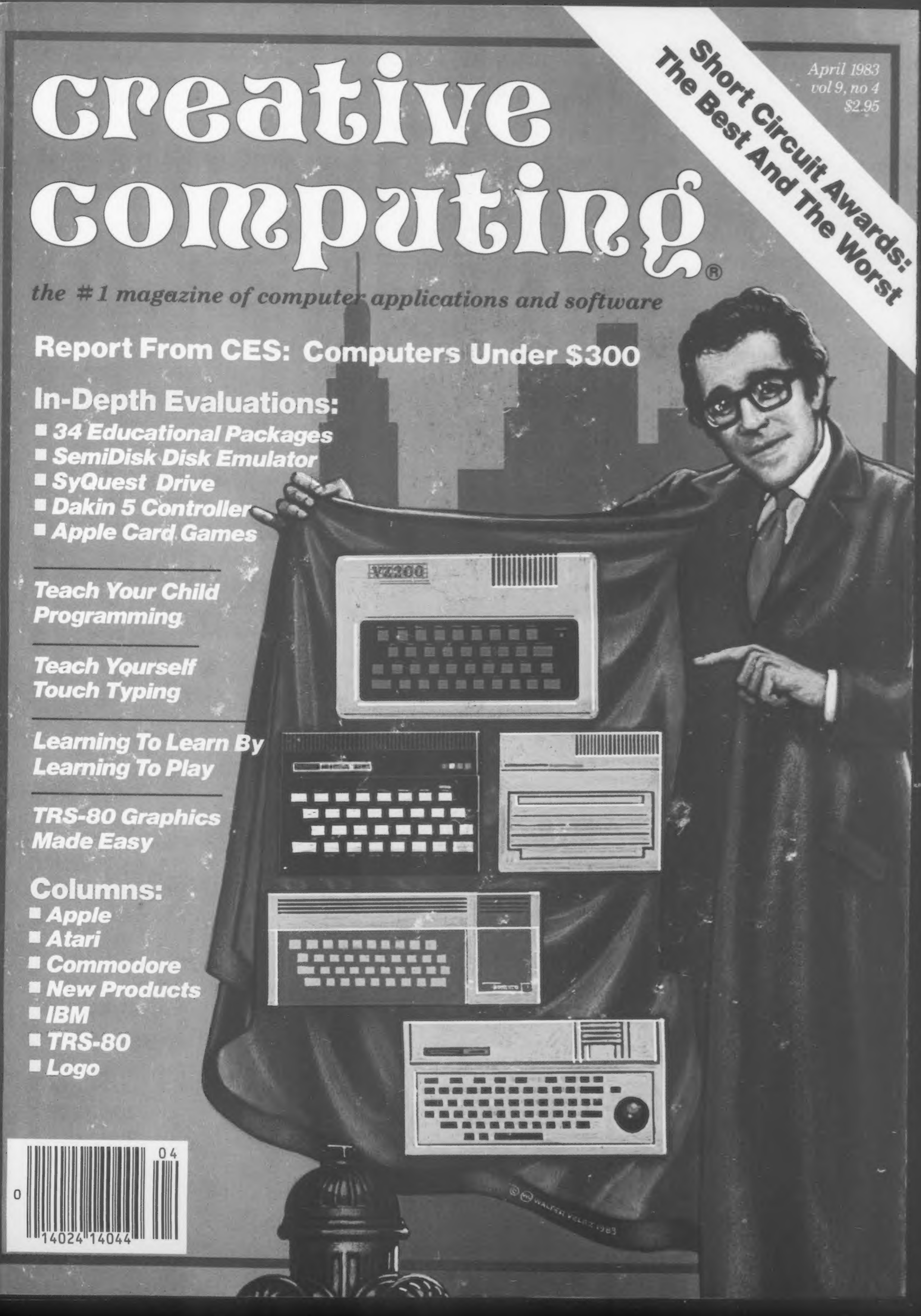

Report From CES: Computers Under $300

In-Depth Evaluations:

- *34 Educational Packages*
- *SemiDisk Disk Emulator*
- *SyQuest Drive*
- *Dakin 5 Controller*
- *Apple Card Games*

Teach Your Child Programming

Teach Yourself Touch Typing

Learning To Learn By Learning To Play

TRS-80 Graphics Made Easy

Columns:

- *Apple*
- *Atari*
- *Commodore*
- *New Products*
- *IBM*
- *TRS-80*
- *Logo*

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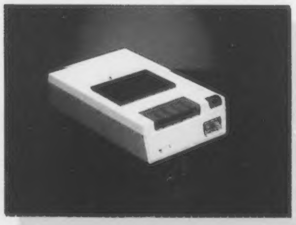

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CAPABILITY. The SV-318 isn't just more capable. It's much more capable. No other computer at even twice the price combines all these extraordinary features: 32K ROM expandable to 96K; 32K RAM expandable to 144K; Extended Microsoft Basic (the industry standard); even Standard CP/M 80-column capability so you can immediately utilize over 10,000 existing software programs. The SV-318 also has a unique built-in joystick/cursor control—an immeasurably useful feature when it comes to playing your favorite video game.

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	SPECTRAVIDEO SV-318	APPLE II PLUS	ATARI 800	COMMODORE 64	NEC 6001	RADIO SHACK COLOR COMPUTER
BASE PRICE	$299	$1,540	$899	$595	$399	$299
COMPUTING POWER FEATURES						
BUILT-IN ROM	32K	12K	10K	20K	16K	8K
EXPANDABLE TO	96K	N/A	42K	N/A	32K	16K
BUILT-IN EXTENDED MICROSOFT* BASIC	YES	YES	ADDITIONAL COST	NO	YES	ADDITIONAL COST
BUILT-IN RAM	32K*	48K	16K	64K	16K	4K
EXPANDABLE TO	144K**	64K	48K	N/A	32K	16K
KEYBOARD FEATURES						
NUMBER OF KEYS	71	51	61	66	71	55
USER DEFINE FUNCTIONS	10	N/A	4	8	10	NONE
SPECIAL WORD PROCESSING	YES	NO	NO	NO	NO	NO
GENERATED GRAPHICS (FROM KEYBOARD)	YES	NO	YES	YES	NO	NO
UPPER/LOWER CASE	YES	UPPER ONLY	YES	YES	YES	YES
GAME/AUDIO FEATURES						
SEPARATE CARTRIDGE SLOTS	YES	NO	YES	NO	NO	NO
BUILT-IN JOYSTICK	YES	NO	NO	NO	NO	NO
COLORS	16	15	128	16	9	9
RESOLUTION (PIXELS)	256 x 192	280 x 160	320 x 192	320 x 200	256 x 192	128 x 64
SPRITES	32	N/A	4	8	N/A	N/A
SOUND CHANNELS	3	1	4	3	3	1
OCTAVES PER CHANNEL	8	4	4	9	8	10
A.D.S.R. ENVELOPE	YES	NO	NO	YES	YES	NO
PERIPHERAL SPECIFICATIONS						
CASSETTE	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	1 CHANNEL	1 CHANNEL
AUDIO IO	YES	NO	YES	NO	NO	NO
BUILT-IN MIC	YES	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	143K	96K	170K	N/A	170K
(LOW PROFILE)	YES	NO	NO	NO	NO	NO
CP/M* COMPATIBILITY (80 column programs)						
CP/M* 2.2	YES	NO***	NO	NO ****	NO	NO
CP/M* 3.0	YES	NO	NO	NO	NO	NO

SETTE

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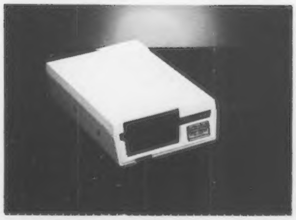

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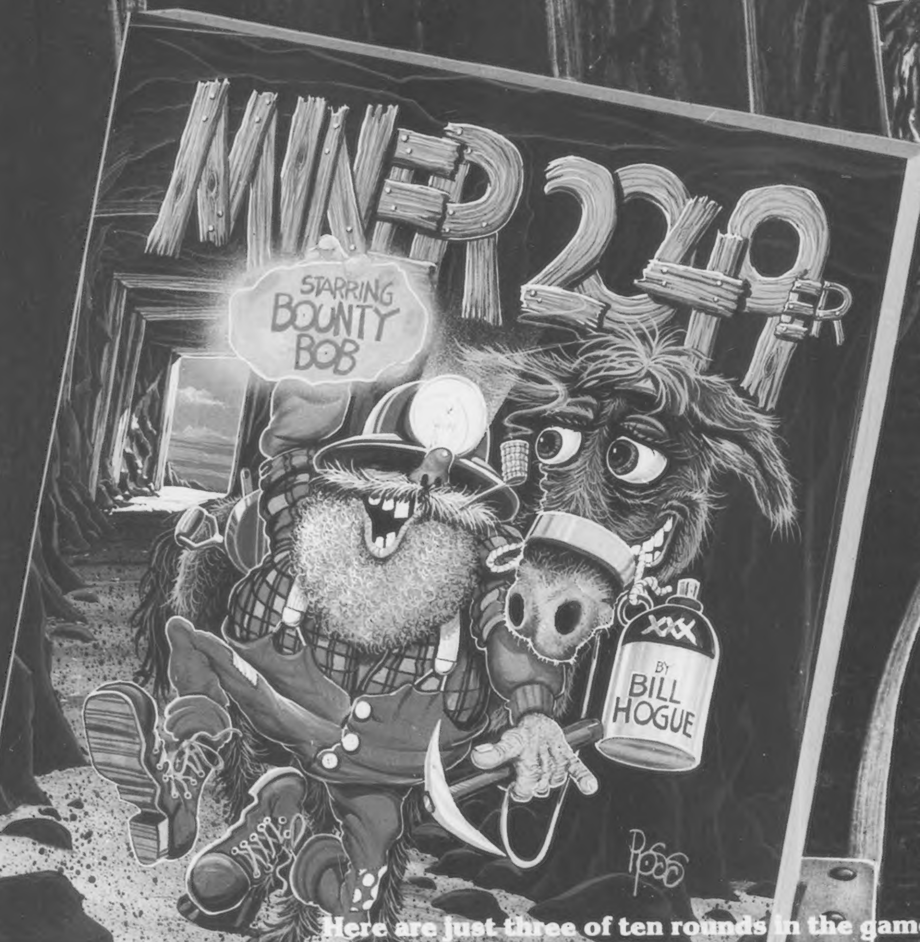

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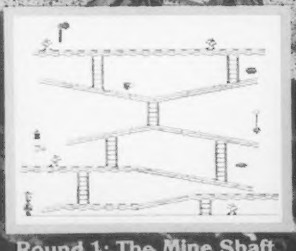

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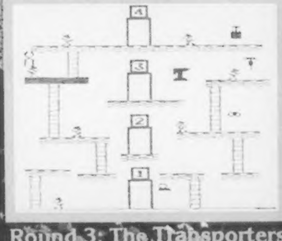
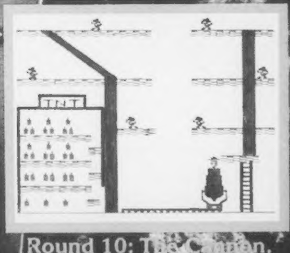
Sharpen your miner's skill!



Round 3: The Transporters.
Beam yourself up!



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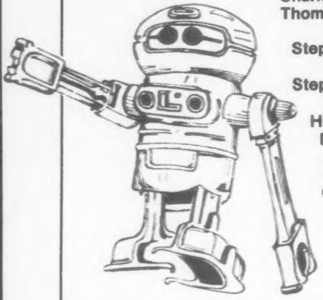

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Ada Wars

Dear Editor:

I feel that I must respond to Mr. Gilpin's article "Two Ada Compilers" in the January 1983 issue of *Creative Computing*.

SuperSoft has always been a leader in the microcomputer software industry because of product excellence and ease of use. Mr. Gilpin seems to have missed the fact that ease of use is a critical consideration for any language compiler which is used as a learning tool. SuperSoft's Ada is not only easy to use, but also a good way to become familiar with the language syntax. The same cannot be said for Janus, RR Software's Ada look alike. SuperSoft chose, initially, to optimize speed of compilation and ease of use, rather than other aspects of language. We are building from that base with further additions.

He also said that SuperSoft's manual was only 29 pages long. True, but he neglected to mention the fact that this was only one of two manuals, the other being the standard DoD document on the language. The fact that we include this standard description should say something about just how standard our Ada is.

Mr. Gilpin complained about SuperSoft Ada's lack of certain data types, yet Janus didn't even have floating point at the same time of his review. SuperSoft's Ada has always had floating point. I urge Mr. Gilpin to try writing an engineering program without it.

Herbert Schildt, President
SuperSoft
P.O. Box 1628
Champaign, IL 61820

Dear Editor:

As the author of the Supersoft/Maranatha Ada compiler, I read the review of Supersoft Ada and RR Software's Janus in the January 1983 issue of *Creative Computing* with interest. Mr. Gilpin has omitted some crucial details which should be brought to the attention of your readers.

Mr. Gilpin doesn't seem to understand the main reason Ada was brought into being in the first place: standardization. The Department of Defense (DoD) wanted a standardized language to solve their problem of rapidly increasing software costs. Standardization offers much for a computer language, including portability from one machine to another, and a base of programmers who don't have to re-learn a new dialect of some language for every new machine they work on, etc. The DoD's position is that Ada is Ada is Ada—a compiler is either full Ada, becoming full Ada (an "incomplete implementation") or is not Ada at all.

This is well and good since RR Software does not call their product Ada but Janus. Why, then, is it reviewed in an article entitled "Ada for CP/M"? And why is it reported as an Ada subset? Further, Mr. Gilpin actually applauds RR Software for deviating from the standard, and not just once, but five obvious times: byte type, ASM statement, conditional compilation, strings, and I/O. This is good news for systems programmers?

He states that 60% of the language has been implemented by Janus and 10% by Supersoft Ada. Where he has found these figures is indeed a mystery. Does the Janus 60% include variations to the standard? Does he compute this percentage by the number of grammar productions implemented? Perhaps by the size of the compiler itself?

He seems to be confused as to the number of sample programs provided. At one point he states there are several sample programs with Supersoft Ada, and at another point he complains that only two programs are provided, "one of which doesn't work." In fact, several programs are provided, including a factorial program, two versions of a CP/M dump utility, and a program which solves the famous Towers of Hanoi problem, a riddle most computer programmers will recognize as a study in recursive techniques. Funny he forgot to mention that. If Mr. Gilpin cannot change one of the programs to run using a terminal with different control codes, well, that is hardly our fault.

Janus may indeed be a good product; but it is not an Ada compiler, nor will it ever be. The Ada compiler which has been implemented by Supersoft/Maranatha Software Systems thus far conforms to the Ada standard, and version two (which has already been released) contains most of the omissions Mr. Gilpin complained about in version one. In my opinion, if you want to learn real Ada, there is but one logical choice.

As a final note, Mr. Gilpin should follow his own advice and feel some compassion for anyone attempting to implement Ada in the CP/M environment.

David C. Norris, Owner
Maranatha Software Systems
500 Catalina Road #305
Cocoa Beach, FL 32931

Dear Editor:

I'm pleased that my articles on Ada ruffled a few feathers. I am also glad that the people at Supersoft offered such a spirited defense of their product. Welcome to the Ada wars, fellows—there's room down here for everyone.

Before answering the objections of Mr. Schildt and then the author of the Supersoft compiler, I would like to ask them a favor. Please send me a copy of the new release of Supersoft

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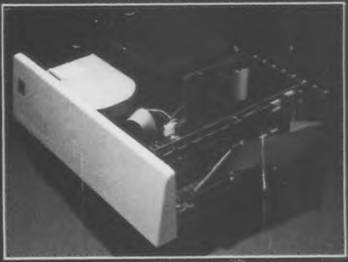

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CIRCLE 274 ON READER SERVICE CARD

Ada. Nothing would make me happier than to write a review praising it to the ceiling. Until then, though, I will have to stick by the conclusions of my previous article.

Now to business. I agree that the Supersoft compiler is easier to use than Janus. Will it still be as easy to use when it incorporates as much of the Ada language as Janus does? Time will tell.

It is also true that Janus deviates from the Ada standard. The tiny fraction of Ada implemented by Supersoft is, indeed, standard. But people who are more interested in learning the language than in quibbling over a few extensions to the standard will continue to choose Janus over Supersoft. As to whether or not there is such a thing as an "Ada subset," I suppose this question has some metaphysical significance to copyright lawyers. I just write programs. (Incidentally, the people at RR Software tell me that Janus will be expanded to the point where it will encompass the full standard. The full language will initially be available for computers based on the 8086/88 processer. RR has no plans to implement it on the Z80. Perhaps if Houdini were still alive...)

I was waiting for someone to call me on those percentage estimates. Naturally, there isn't any algorithm for determining how much of a language is present in a particular compiler. The numbers came from a source we writers tend to trust as much as computer printouts—intuition. But if someone comes up with an empirical test to check my intuition I'll be surprised if the results are much different. I do, however, apologize for giving the mistaken impression that the Janus compiler is six times as large as the Supersoft compiler. It is eight times as large.

I *did* mention (in the eighth paragraph of the review) that Supersoft provides the Ada Language Reference Manual (LRM) along with its own document. RR has always offered it as an extra. Unless you are very serious about Ada, I wouldn't bother with the LRM—it is so poorly written that it is practically unreadable.

There was one thing about my review for which I must seriously apologize—the misprint about Supersoft supporting two "programs." Correcting the misprint to "pragmas" suddenly makes the paragraph make sense in light of my earlier comments in the article. To clear things up, Janus has ten pragmas (compiler directives), two of which are defined in the LRM. Supersoft has two pragmas, one of which—LIST—appears in the LRM. Unfortunately, LIST is the one which does not work. (Supersoft should understand misprints. One of their early ads boasted that their compiler supported a "floating disk." The original draft of my review contained a very low swipe at this which, happily, I removed.)

I suppose that covers everything. Again, I would like to emphasize that I really don't like writing negative reviews. I hope that Supersoft can send me a version of their Ada compiler that will make me eat my words.

While I'm here, I might mention that the Telesoft Ada compiler, the most complete version of the language on the market, is now available for the IBM Personal Computer. It's not cheap—the compiler alone is $3000 and you have to beef up your PC to 256K. I've been using it for several months now and it is superb. If there is enough interest I would be glad to review it along with the new editions of Janus and Supersoft Ada.

Geoff Gilpin
1018 N. Leminwah St.
Appleton, WI 54911

Magic Fingers

Dear Editor:

We read with interest the article on the Brailleprinter. Personal Micro Computers also makes a solenoid driven typing robot which we call Electric Typing Fingers (Model ETF-80). Our ETF-80 has also been operated with the Braillewriter by several individuals whose names and addresses are available by writing to PMC. We understand that, with the ETF-80, modifications to the Braillewriter key tension are not required. The ETF-80 is available with cable for the following computers: Apple with Apple printer card; Apple with Epson printer card; TRS-80 Model I or III; TRS-80 Model II; and IBM-PC.

The price is $595 with cable; the IBM-PC requires in addition a $25 adapter. The interface is Centronics parallel so it can be adapted to other computers having a Centronics parallel printer interface.

R. Ronald Troxell
Marketing Director
Personal Micro Computers, Inc.
475 Ellis St.
Mt. View, CA 94043

Bursting Our Bubble

Dear Editor:

I have just finished reading the fine article on sorting and searching techniques in the December, 1982 issue. Listing 3 on page 289 may be made more efficient by changing line 1010 to:

```
1010 FOR J = I + 1 TO N
```

Although this sort has been described as a Bubble Sort, I know it as a Linear Sort With Exchange. The Bubble Sort, which exchanges adjacent records at each step, is more efficient than the Linear Sort With Exchange, but is less efficient than the Shell Sort. I did not see a true Bubble Sort in this article.

You have a fine magazine and the presentation of efficient algorithms is appreciated.

Robert F. MacDougall
1349 Lonfellow
Canton, MI 48187

What Hath PC Wrought

Dear Editor:

It was reassuring to see that "Line 990 is not a gag. The BEEP Toggles an 800MHz tone through the PC speaker for a quarter of a second," in "Programming Wheels" on page 258 of your January issue.

Using this little known feature of the IBM PC, I developed the following short program:

```
10 X = 40
20 FOR I =1 to X
30 BEEP
40 NEXT I
```

Changing the value of X allows one to defrost a TV dinner, warm up coffee in a styrofoam cup (not metal!), or communicate line-of-sight with another PC—without using a modem.

Thanks to Mr. Hastings for revealing this surprising function.

Mark Hull
1395 Buchanan Place N.E.
Columbia Heights, MN 55421

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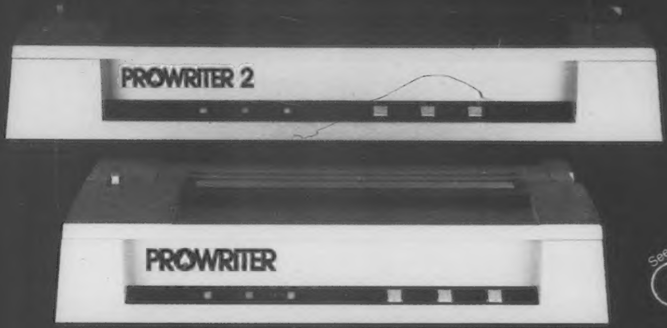

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CIRCLE 193 ON READER SERVICE CARD

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NECC 83

David H. Ahl, founder and editor-in-chief of *Creative Computing* magazine, will be the keynote speaker at the 5th Annual National Educational Computing Conference (NECC) to be held at the Baltimore Convention Center June 6-8, 1983. Mr. Ahl will speak at the opening session, Monday, June 6, at 10:00 a.m. on the subject, "The State of the Art in Educational Software."

NECC 83 will feature contributed papers, tutorials and workshops in all areas of educational computing from research to instructional software to administrative applications. Special emphasis is being placed on sessions dealing with computing in elementary and secondary schools.

For further information and advance registration forms contact the NECC 83 Annual Chairman, Doris Lidtke, Department of Mathematics and Computer Science, Towson State University, Baltimore, MD 21204.

1983 Applefests

Three Applefest Shows and Conferences will be held in 1983.

For the 1983 events, Northeast Expositions has added conferences, seminars, workshops and panel discussions which are designed to show users how to get the most out of their Apples. Approximately 350 exhibitors are expected to participate in each of the 1983 events.

The 1983 Schedule is as follows:

Applefest/Anaheim
Anaheim Convention Center
April 15-17

Applefest/Boston
Bayside Exposition Center
May 13-15

Applefest/San Francisco
Moscone Center
October 28-30

For more information call or write: Northeast Expositions, 826 Boylston St., Chestnut Hill, MA 02167. (617) 739-2000 or (800) 841-7000.

Computers/Graphics in the Building Process

BP '83—"Computers/Graphics in the Building Process," co-hosted by The National Academy of Sciences' Advisory Board on the Built Environment (ABBE) and the National Computer Graphics Association (NCGA) and sponsored by the World Computer Graphics Association (WCGA) will be held at the Washington D.C. Convention Center, April 4-8, 1983.

For further information contact: World Computer Graphics Association, 2033 M Street, N.W., Suite 399, Washington, D.C. 20036. (202) 775-9556.

TRS-80 Joystick Update

In the October 1982 issue of *Creative Computing* we ran an article on installing a joystick on the TRS-80 Model I and III. Apparently the keyboards on some TRS-80s, particularly those sold outside the U.S., are different from those shown in the article.

If your keyboard does not conform to the diagram, simply use an ohmmeter to determine which is the common lug on the five keys. There will be zero resistance between them. Then solder the connections to the other lug, except on the spacebar where both connections will be used.

Thanks to Hector Jasso of Nuevo Leon, Mexico for bringing this to our attention.

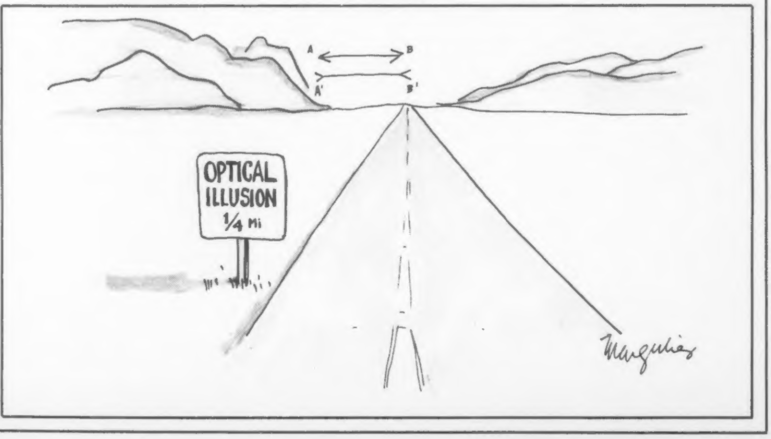
Corrections

In the article "Fin-Apple Ratios" (February 1983), the following ratios were listed incorrectly.

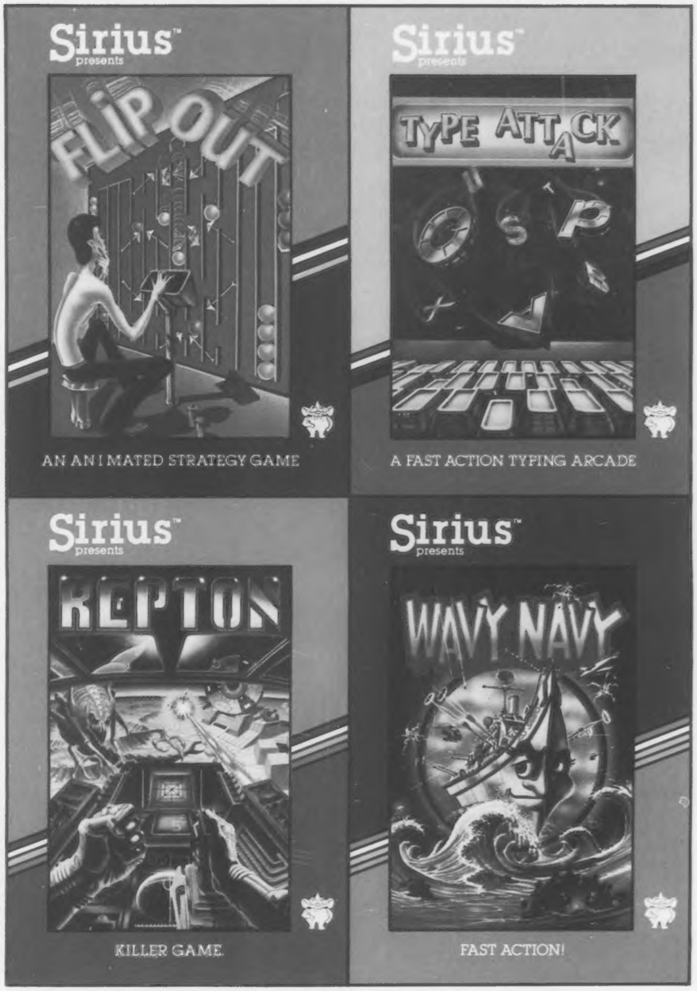
Under Profitability Ratios — Gross Margin Ratio = 41.71 not 41.5.
Under Coverage Ratios — Total Interest Charges = 14 not 100.
Under Stock Ratios — Earnings Per Share = .14 not .875.
Price to Earnings = 85.7 not 13.7.

Fin-Apple Ratios

Canadian readers will be interested to know that the Brigham textbook referenced in the article "Fin-Apple Ratios" (February 1983) will be available in April, 1983 as *Canadian Financial Management: Theory and Practice*, Brigham, Kahl, and Rentz, Holt, Rinehart and Winston of Canada, Toronto, 1983. The book contains a microcomputer application to capital budgeting, using an electronic spreadsheet.



Have A Great Playday!



Take your marble to the top. Pick your spot and let it drop. Hope for a flip instead of a flop. Once you get it, the fun never stops! It's FLIP OUT — a crazy new strategy game for one or two players. Each marble you drop causes a chain reaction, so take your time and plan carefully. Plan right and you'll flip, if you didn't you Flip Out!

Turn your keyboard into a typing arcade! You can blast attacking letters and words right out of the sky. Type Attack was designed by a professional educator and the fast action game experts at Sirius. It features 39 pre-programmed lessons and 60 user defined lessons. Great sound, graphics and a real-time words per minute bar make improving your typing skills fun!

It is up to you to stop the invasion of the evil Quarriors and save Repton. You are armed with devastating Nuke Bombs, a Radar Screen, a Laser Gun and an Energy Shield. You'll need them all! You'll be attacked by Nova Cruisers and Single Saucers. You must avoid Spye Satellites and deadly Dyne-Beam Shooters and you must stop the Draynes from depleting the Reptonian power supply. Repton is a battle so thrilling you'll be relieved to find out you're still on earth when it's over!

Talk about adventure on the high seas! You're blasting away at a squadron of enemy bombers and Kamikaze fighters from the deck of your P.T. boat. Suddenly you notice the sea is loaded with mines and an Exocet missile is screaming toward you on the horizon. Instinctively you jerk the joystick to the starboard, keeping your thumb on the fire button. Phew! That was close! Sometimes it's hard to believe Wavy Navy's just a video game.

New Games For Your Apple II From Sirius™

Type Attack, Wavy Navy, Flip Out and Repton packages, programs, and audio visuals © 1982 Sirius. Type Attack, Wavy Navy, Flip Out, Repton and Sirius are trademarks of Sirius Software, Inc. Apple is a trademark of Apple Computer, Inc.

For more information contact your local Sirius dealer or distributor or contact us at 10364 Rockingham Drive, Sacramento, CA 95827, (916) 366-1195.

CIRCLE 269 ON READER SERVICE CARD

ow...dateline:tomorrow...dat

David H. Ahl

IBM Discounts for Schools

At the present time, the big four in the education market are Apple, Tandy, Atari, and Commodore. Now IBM wants to get in and they figure the best way to do it is with big 20% plus discounts.

A typical configuration for school use consists of the cpu, 64K of RAM, 12" color monitor, single 160K disk drive, and DOS, and carries a list price of $2545. With the school discount, this system will now sell for $1995.

A word processing configuration with 64K, 12" b&w monitor, graphics printer, disk drive, DOS, and the Typing Tutor package lists for $3900. With the school discount applied, it will sell for $3079, a 21% discount.

But Do Schools Really Want Computers?

Educators seem to be sharply divided over efforts to obtain Federal subsidies for putting personal computers in classrooms at little or no cost to the school district. The legislation, sometimes known as the Apple bill, passed the House in 1982. This permits manufacturers to donate computers to schools and take a tax writeoff equal to approximately twice the manufacturing cost of the machine.

But the Senate has not passed the bill, primarily because the National Education Association and other educational groups oppose it. Why is the NEA opposed? Because, they say, existing computers are going unused in schools because teachers have not been trained to use them. Other educators complain that the software is unimaginative and ill-suited for students. (They apparently are unaware of the basic principle of the free enterprise system. Specifically, if there is a market, companies will develop a rich assortment of good products for it; if there is not a market, they won't.)

Some educators, of course, are in favor of the bill. But without the support of the politically active NEA, it is unlikely that free computers will hit the schools for quite some time.

Computers At Colleges and Universities

Since writing in the December 1982 issue about the requirements of Carnegie-Mellon Univ. and Stevens that students have their own personal computers, I have been informed that 1000 Clarkson freshmen will receive Zenith Z-100s in the fall of 1983 and that RPI has a similar program, but on a pilot basis with just 60 students.

Are there other colleges with similar programs? If so, we'd like to hear about them. In particular, we'd like to know how many students are involved, in what disciplines, what years (freshman, sophomore, etc.), what computer is being used and how it is to be purchased.

And You Thought Video Games Were Dying

Wall Street in its characteristic way reacted violently when Warner announced that Atari sales would fall below expectations. "Sell Warner, sell Coleco, sell Mattel," shouted the securities analysts. And investors did, driving the share prices of many game companies to new lows for the year.

But at CES, the mood was just the opposite. Game manufacturers went home with their order pads full. Many audio retailers planned to add game departments and several decided to add computers as well.

Currently, Atari dominates the video game market with about two-thirds of the installed base. However, with Mattel, Coleco, N.A.P., and some others coming on strong, we would expect Atari's share to diminish somewhat, although it is unlikely that they will lose their enormous lead altogether.

As for the overlap between video games and personal computers, with the prices of computers plummeting, we expect to see more and more people having both a video game and computer, or more than one of each. Today, about 40% of personal computer owners also own a video game system while 22% have two or more computers. I wouldn't be surprised to see a dramatic increase in those percentages by the end of the year.

Sign of the Times

I recently visited Mahopac High School to give some presentations on technology in education. My talks were in the library.

A large sign on the desk proclaimed, "Please ask for these at the desk: Creative Computing, Cycle, Field and Stream, Hot Rod..." The seven other magazines on the list included mostly motoring and sports magazines, but no other computer titles. Over 100 other magazines were on the open shelves, including some of our "competitors."

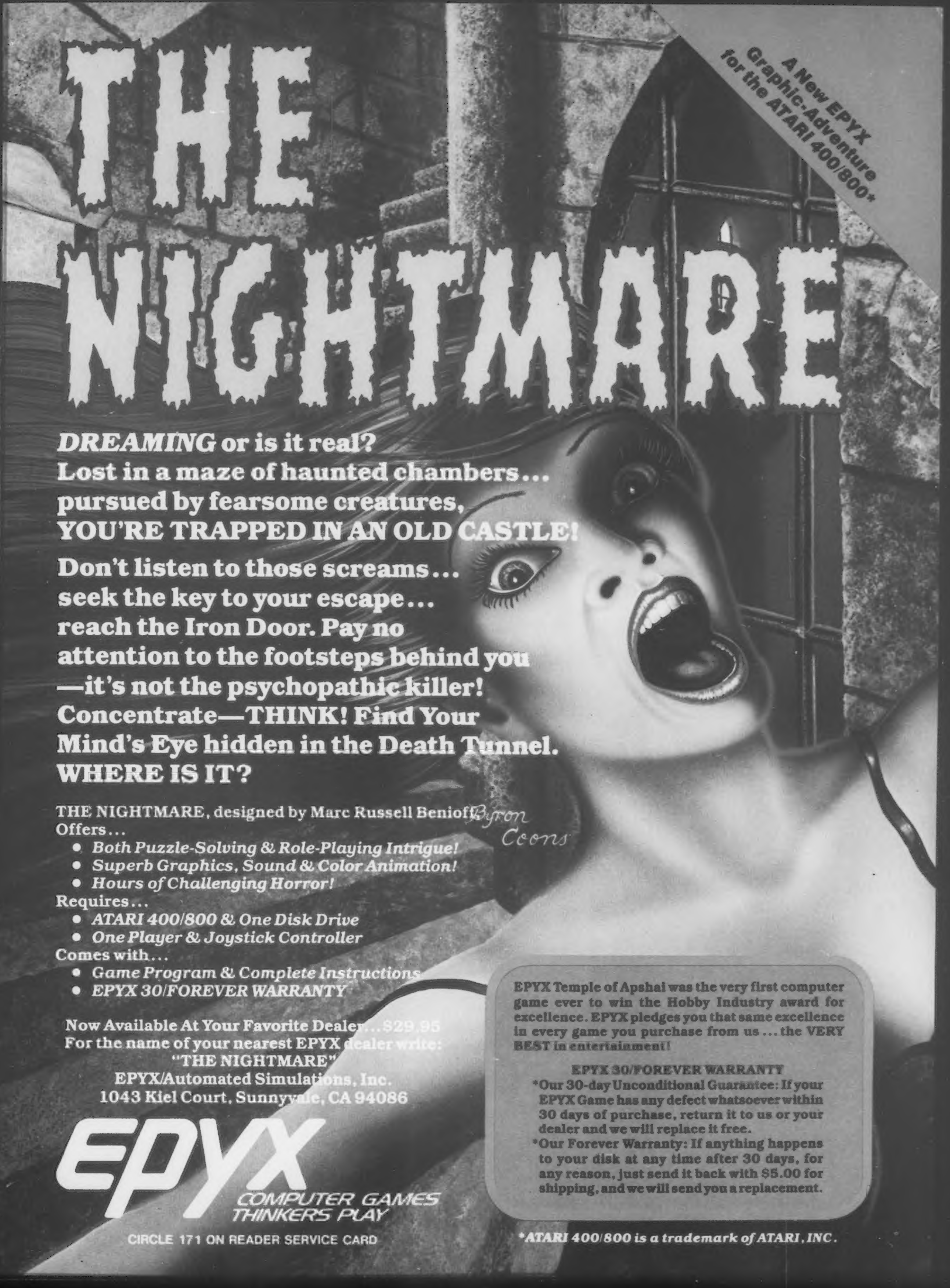
I was there on November 2. The December issue had arrived a few days earlier and was already dogeared. Thanks, Mahopac.

Random Observations and Notes

In the second and third weeks of January, nine out of the ten issues of The Wall Street Journal had articles about personal computers.

The IBM home computer, dubbed "Peanut," will have a retail price of around $630.

We welcome Ken Uston as editor-at-large. Ken is widely reputed to be the world's foremost blackjack player. After being banned from many casinos, he turned to videogames and wrote Mastering Pac-Man as well as four other books on coin-op and home games. He has now turned his considerable writing talent toward personal computers; his first book on the subject will be published this spring and you will see him regularly on these pages.



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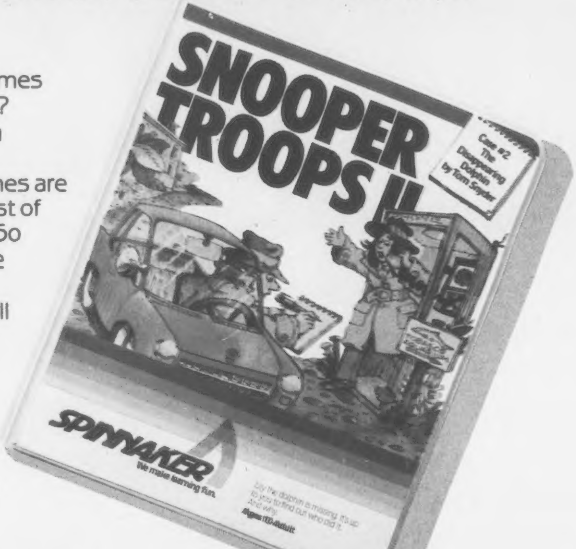
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THE FUTURE OF COMPUTERS

All About Videodiscs

7 Years Ago in creative computing

The main topics of the March 1976 issue were artificial intelligence and videodiscs.

Bertram Raphael of the SRI AI Center felt that the computer was far more than an obedient intellectual slave and that it soon would be able to solve general problems spoken to it as questions.

The issue had a comprehensive primer about AI and posed some sticky ethical questions like, "does man have the right to create a race of robotic slaves?"

Fueling the discord in the AI community were reviews by Herbert Dreyfus of books by Marvin Minsky, Seymour Papert and Patrick Winston.

An article by Tien Chi Chen of IBM pointed out that the ratio of the cost to program and debug a line of code to the cost to execute the line had reached the astronomical value of 100 million. Today, the ratio is more like 30 billion, a dramatic demonstration of the worth of human brainpower. Chen felt strongly that human convenience should be maximized at the expense of machine time whenever possible; perhaps this partially explains the phenomenal growth and appeal of personal computers.

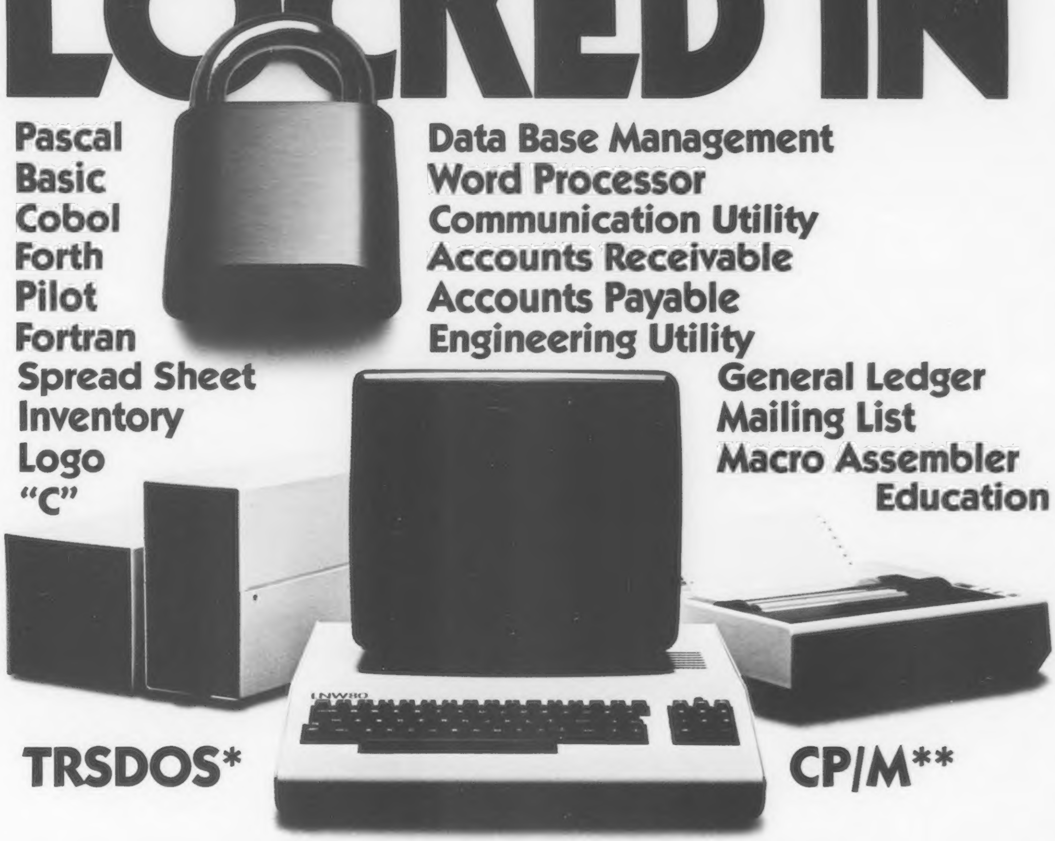
Three articles discussed videodiscs and the possibility of linking them to computers. No videodiscs were on the market then, yet it is surprising how close to reality the visions of Alfred Bork and Art Luehrmann turned out to be.

Martin Harwit, an associate of Carl Sagan at Cornell, wrote about the possibility of communicating with other intelligent species across the universe.

Bruce Horn wrote a wonderful piece about a flight simulation program he had written in Smalltalk, and David Struble wrote a dynamite Mastermind game simulation.

The ads included one for a Black Watch kit from Sinclair for $31.95, an Altair 680 kit for $345 and systems from DEC and HP for $30,000 plus. Quite a range! ☐

DON'T GET LOCKED IN



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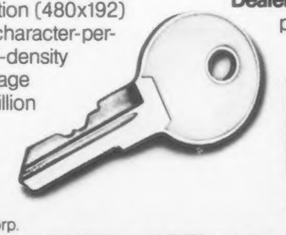

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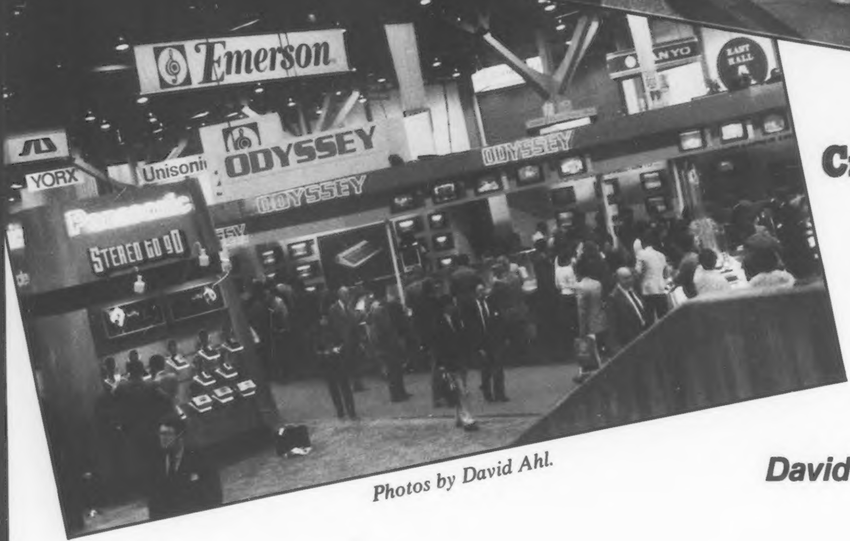
1983 Winter Consumer Electronics Show



Photos by David Ahl.

Creative Computing presents the Short Circuit Awards

David H. Ahl and Betsy Staples

The Short Circuit Awards. Huh?

Well, *New Jersey Monthly* has the Rotten Tomato Awards every year. (We hope you all know that the best and biggest tomatoes come from New Jersey, consequently, the largest rotten ones for throwing at dismal performers are found here too.) *Omni* isn't too imaginative, calling their awards, "19xx's Worst Scientific Achievements." Someone else has the "Dubious Distinction Awards," the radio/TV industry has bloopers, and so on.

Since the consumer electronics industry is built around silicon electronic chips, we decided that a more dubious kind of chip was appropriate for our awards of distinction. What kind? Potato chips? Well, maybe, but it doesn't really suggest "not very good." Wood chips? Nah, no class. Buffalo chips? Yes, yes, we thought. But on the cover of a classy magazine like *Creative Computing*? No, it just wouldn't do.

So we brainstormed scores of possible terms on the flight between Las Vegas and Chicago. It took us a few hundred nanoseconds—our brainstorming, not the flight. We finally decided that Short Circuit Awards was right. It describes an idea that went awry and, as all electrical engineers know, it can't be spelled correctly. For four years at Cornell, one of us spelled circuit, "circut," just like every other EE student. Three years out, he learned better.

But we digress.

At the 1983 Consumer Electronics Show, we saw a great number of marvelous innovations. We also saw some incredible abuses and misuses of electronic technology. So in this roundup of new products, redesigned products, and regurgitated products, we have presented a number of awards—some for innovation and some for other things. Incidentally, we hate the use of the term, "a number of." It is horribly imprecise. Why not use "couple" for two, "several" for three or four, "scores" for 40 to 99, "more than 100" for more than 100, and so on? But notice, what does one use for a number between 5 and 39? "Tens of?" Well, maybe. "A number of?" No! That could be anything between two and infinity minus one. Good grief!

To avoid "a number of," we read ahead and counted the Short Circuit Awards and "real" awards. There are 33 of them. Read on—we're sure you'll find some of them of interest. But be warned, you will have to determine which awards are for true achievements and which are for dubious ones.

Enough, enough. Onward!

Last Things First

Toward the end of the show (Winter Consumer Electronics Show, Las Vegas, January 6-9, 1983), someone asked us, "How cum *Personal* and *Popular* and *Byte* and all them folks aren't here?"

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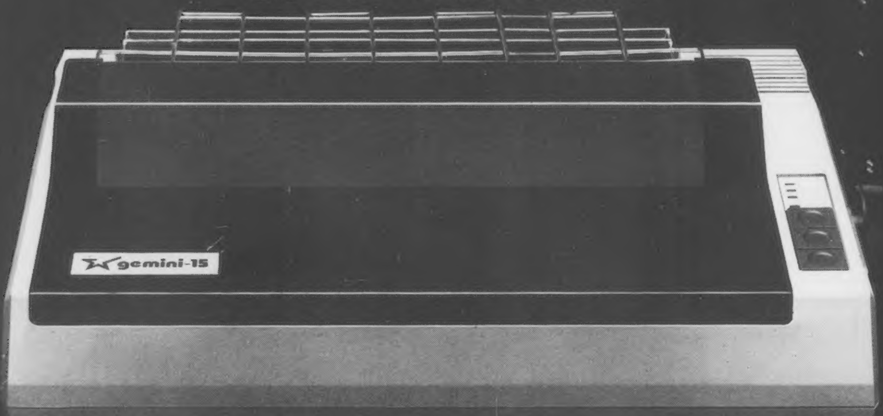

Over thirty years of down-to-earth experience as a precision parts manufacturer has enabled Star to produce the Gemini series of dot matrix printers—a stellar combination of printer quality, flexibility, and reliability. And for a list price of nearly 25% less than the best selling competitor.

The Gemini 10 has a 10″ carriage and the Gemini 15 a 15½″ carriage. Plus, the Gemini 15 has the added capability of a bottom paper feed. In both models, Gemini quality means a print speed of 100 cps, high-resolution bit image and block graphics, and extra fast forms feed.

Gemini's flexibility is embodied in its diverse specialized printing capabilities such as super/sub script, underlining, backspacing, double strike mode and emphasized print mode. Another extraordinary standard feature is a 2.3K buffer. An additional 4K is optional. That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

Gemini reliability is more than just a promise. It's as concrete as a 180 day warranty (90 days for ribbon and print head), a mean time between failure rate of 5 million lines, a print head life of over 100 million characters, and a 100% duty cycle that allows the Gemini to print continuously. Plus, prompt, nationwide service is readily available.

So if you're looking for an incredibly high-quality, low-cost printer that's out of this world, look to the manufacturer with its feet on the ground—Star and the Gemini 10, Gemini 15 dot matrix printers.

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CES, continued...

We said something about knowing which way is up and so on. We also observed that we (*Creative Computing, SYNC*, etc.) have been going to CES for the past four or five years, ever since a personal computer appeared on the show floor. On the other hand, many of our would-be competitors tend to put more emphasis on advertising sales and circulation promotion at the shows and less on editorial coverage than we do.

But we digress. This is the last time—promise!

Adagio for Audio

Three years ago, the audio and video folks owned the convention center. On the "overlook" level, all you could hear was one hi-fi manufacturer trying to outblast another—literally. The listening rooms were even worse—120 db if you were lucky. If you wanted to go home with your hearing intact, it was advisable to put cigarette filters in your ears before you entered the listening rooms of Audio Tecnica, Fosgate, Ohm and others.

Today? "Slow? You don't know slow. I saw my last customer hours ago," said one hi-fi manufacturer sitting forlornly in his deserted listening room. The exotics were doing okay (no recession among the well-to-do), but for the mid-range folks it was disasterville.

So, audio is in the doldrums, or perhaps on a long plateau. Video, ditto. Auto sound, ditto. Calculators and watches, don't ask.

Yet the attendance at CES was way up, hitting nearly 80,000. Why? Because of surging growth in four product categories: telephones (the AT&T monopoly is over), satellites (spreading like overgrown mushrooms) and, you guessed it, video games and computers. There were over 100 new video games introduced and no fewer than ten new computers under $300.

This isn't a trade publication, so we won't belabor the prognostications of industry leaders except to say that we agree. Computers are Number 1. But there were some other neat products too.

They Said It Couldn't Be Done

Androbot, a new company, introduced B.O.B. and TOPO, a pair of nifty robots with unique functions and behavior. Conceived by their creators as socially interactive devices, the Androbots offer a multitude of attributes designed to provide entertainment and education.

The Androbot concept came from Nolan Bushnell. Bushnell, founder of Atari and the Pizza Time Theater restaurant chain has set up a corporate umbrella called Catalyst Technologies in Sunnyvale to provide capital and structure to innovative companies.

Androbot president Tom Frisina and friend, B.O.B.

Androbot president Thomas Frisina told us that B.O.B., an acronym for "Brains on Board," features true "artificial intelligence," talked of for years, but never before offered in a tangible consumer product. B.O.B. was clearly the hit of the show and for him, we present to Androbot the

Nifty New Product Award

B.O.B. has three 16-bit 8088 mpu's, three megabytes of memory, and five ultrasonic sensors which locate and measure each object in its immediate environment. Thus, B.O.B. can navigate with human-like accuracy. His wheel and drive assembly permits forward motion and turning with no danger of tipping over. B.O.B. also has two infra-red sensors so he can differentiate between humans and other objects based on temperature. *Creative Computing* will have a comprehensive article on B.O.B. ($2500) and his companion TOPO, which is really a mobile extension of a home computer, in an upcoming issue.

NEW KOREA INDUSTRIAL

As the baby wets his nappy, the sweet melody rings out!

Since B.O.B. is, in our opinion the niftiest new product at CES, we thought you might want to hear about the other end of the spectrum. We had a tough time deciding who should get the

Tacky New Product Award

With no fanfare at all, this goes to the New Korea Industrial Company for their Baby Bell. This is a small solid state "electronic urination sensor." According to the manufacturer, "the Baby Bell which rings out that sweet melody as the baby wets his nappy is a joy and delight to any mother." Pavlov would love it.

Runners up included a flat speaker which fits in musical panties for both sexes; the slogan was "feel the beat in your seat." Another was an X rated video game with such poor resolution that we mistook a naked woman for a pink tank.

Video Games for the Atari VCS

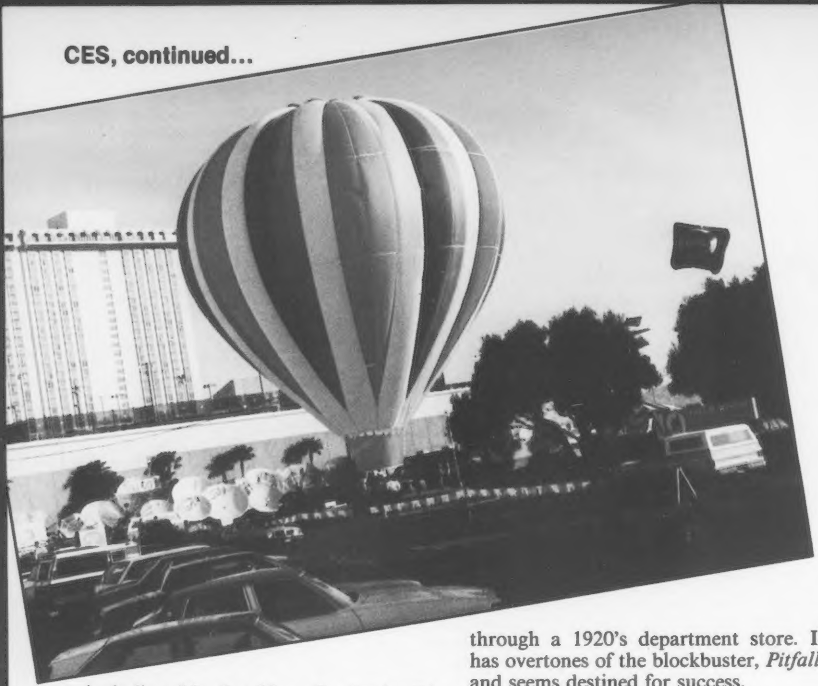
The stock market and many industry analysts have not been kind to Atari of late. However, as Mark Twain once said, "reports of my death are greatly exaggerated." With over 100 new cartridges for the VCS and a dynamite new line of educational cartridges from Atari, we think the VCS will be with us for some time to come. To get started in the category, we must first present the

Best New Products from the Most Boring Press Conference Award

This goes to *Atari* in cooperation with the Children's Computer Workshop for their release of five CCW games for three to seven year olds. Paul Firstenberg, president of CCW was an absolute disaster at the press conference, but, fortunately, the games are wonderful. They include *Oscar's Trash Race* to reinforce counting and number skills, *Cookie Monster Munch, Big Bird's Egg Catch* (a simplified *Kaboom* type of game), *Grover's Music Maker,* and *Alpha Beam* in which the player must manipulate a small spaceship to retrieve letters and place them where they belong.

This line of games will be augmented with other Atari games for pre-teens using Peanuts and Disney characters to be released later this year. Three Disney games were also announced by Walt Disney Telecommunications: *Mickey and the Beanstalk, Mickey and the Great Outdoors,* and *Dumbo Flies Home.*

In addition to the children's line, Atari announced a whole host of VCS games based on popular arcade games

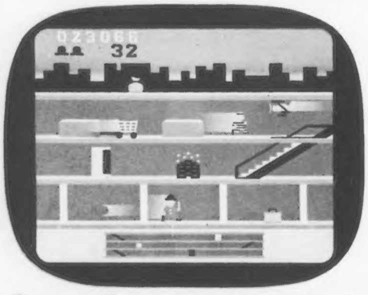


including *Ms. Pac-Man, Centipede, Dig Dug, Kangaroo, Jungle Hunt, Phoenix, Vanguard,* and *Galaxian,* as well as "Real Sports" *Football, Tennis,* and *Soccer.*

Atari also announced a similar line of games for the new 5200 game system which also includes *Pole Position, Space Dungeon,* and *Countermeasure.*

Activision appears to have added several more winners to their stable of games. In *River Raid,* by Carol Shaw whom we interviewed on these pages last year, the player must pilot an assault jet over a constantly-changing course and blast away enemy choppers, jets, ships, bridges and oil depots. A highly addictive game!

Other new games from Activision include *Seaquest,* a submarine rescue game; *Spider Fighter,* a bug blaster game; *Oink!,* a game loosely based on the story of the three little pigs; *Dolphin,* an undersea chase game; and *Keystone Kapers,* a madcap chase between a lovable Irish cop and a roguish robber through a 1920's department store. It has overtones of the blockbuster, *Pitfall,* and seems destined for success.



Keystone Kapers by Activision for the Atari VCS.

Jim Levy, president of Activision and an old friend from the MBA program at Carnegie-Mellon, told me that Activision is trying to hire 20 to 30 new game designers. We think Jim's policy of putting the game designers in the limelight is a good one and creates a better company personality than keeping the identity of the designers secret lest some competitor hire them away. Jim also mentioned that Activision will be bringing out software for the Atari home computer later this year. We can't wait!

Is it time for another award? Sure.

Most Hoopla Behind a Game Award

This award goes to **Fox Video Games** for their introduction of *M*A*S*H.* The press conference introducing the game was held in an Army mess tent set up in the parking lot of the convention center. It was regulation issue throughout from the balky jeep to the huge juice vats to the 4077th caps given to all the attendees.

We were surprised, however, that when Jamie Farr (Sgt. Maxwell Klinger) showed up, he was in civies and not in uniform. After a few jokes, we learned that the *M*A*S*H* game will be available not only for the VCS, but the Atari computers, Vic 20, TI 99/4A, Intellivision and ColecoVision.

Inside the convention center, the Fox "booth" was a replica of "The Swamp." In addition to the *M*A*S*H* game, they showd nine other new games including *The Revenge of the Beefsteak Tomatoes, 9 to 5* (a secretary-boss shoot-out), *Meltdown, Flash Gordon* and *The Crypts of Chaos,* a fantasy role-playing game.

Comma-Vid announced three new VCS games. *Cakewalk* is a cute game in which you have to unload cakes coming out of a kitchen on six conveyer belts. Watch out for the gingerbread man! *Rush Hour* is a driver's nightmare come true, while *Stronghold* requires you to blast through whirling force fields to destroy lethal alien planet crawlers.

CBS Video Games introduced six new ones. Two, *Wings* and *Tunnel Runner,* use a proprietary RAM+Plus chip that triples the memory capacity of the VCS thereby permitting a significant increase in the complexity and graphic detail of the TV image. *Wings* is a realistic jet fighter game while *Tunnel Runner* is a three-dimensional perspective maze game.

The four other games introduced by CBS are all versions of Bally/Midway coin-op games including *Wizard of Wor, Gorf, Blueprint,* and *Solar Fox.* The literature says of *Gorf,* "the player who is unable to adapt his strategy is doomed." That's for sure; we never did get past the third board, but we sure had fun trying.

CBS also recently purchased K-Byte, a producer of Atari 400/800 games. Games in this line include the K-Razy series (*Antiks, Kritters, Shoot-Out,* and *Star Patrol*) with three more on the way, *Boulders and Bombs, Mountain King,* and an educational game, *Time Trials.* Watch these pages for reviews of these.

OFFICERS MESS
M·A·S·H
4077TH

*Jamie Farr with the Fox Video M*A*S*H game.*

Mattel expanded their line of M Network cartridges for the Atari VCS with nine new games. In the *Adventures of Tron* you must avoid the pursuing paralyzing recognizers, cannon-firing

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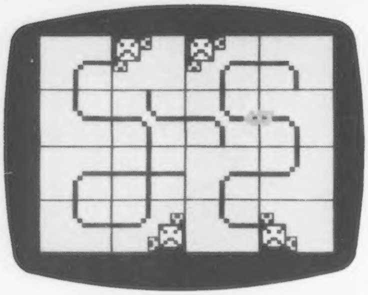
CIRCLE 263 ON READER SERVICE CARD



Loco-Motion by M Network for the Atari VCS.

tanks, and persistent grid bugs. *Air Raiders* is a jet fighter game, and *Star Strike* is a simulated 3-D flight through space. Mattel has produced home versions of two Data East coin-op games, *Loco-Motion* and the runaway success, *Burgertime.*

Other new Mattel M Network games include *Computer Revenge* in which you must defend the human race against hostile computers (it's true!), *In Search of the Golden Skull* and *Advanced Dungeons & Dragons.*

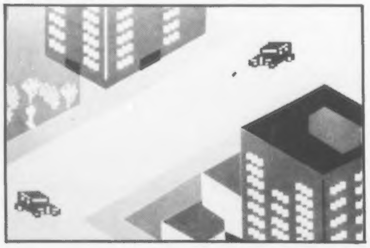
Mattel also announced several children's games (ages 4 to 9) for the VCS. These include *Scooby Doo, Masters of the Universe, Rocky and Bullwinkle,* and *Kool-Aid.*

And now it is time for another award.

Games in Most Formats Award

No question about this one; it goes to **Imagic.** *Demon Attack,* that fantastic Imagic game for the VCS, is now available for Intellivision, Odyssey, Atari computers and the Vic 20. Their popular *Atlantis* game will also be available in four formats. Bill Grubb, Imagic's genial president, told us that Imagic would also be producing games for ColecoVision and the TI 99/4A, thus bringing to seven the number of game systems and computers supported by Imagic.

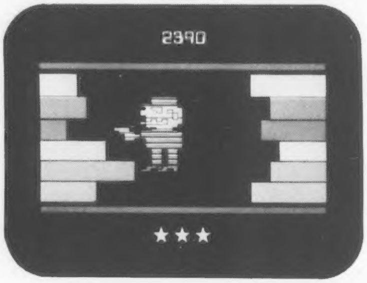
Imagic unveiled no fewer than 17 new game cartridges at CES. We didn't have a chance to play them all; some of the intriguing ones we did play include *Safecracker* with sensational 3-D graphic effects; *Dragonfire* in which you must recover treasure from a castle taken over by dragons; *Ice Trek,* a Nordic adventure game; and *Escape From Argos* in which you are carried around by Pegasus to do battle with one infuriated Fury after another.



Safecracker by Imagic for Mattel Intellivision.

Imagic also introduced a child-oriented (ages 5 to 9) game, *Shootin' Gallery,* a colorful, cute shoot-'em-up. P.S., adults will like it too.

U.S. Games introduced an incredible array of 12 new VCS games. In *Squeeze Box,* you try to shoot your way out of a diabolical ever-shrinking jail cell. Three "funny" games include *Picnic* in which you must swat flies away from your hamburgers, *Gopher* in which you defend your farm from marauding gophers, and *Piece 'O Cake* in which you must decorate cakes as they emerge from the oven on a conveyer belt, very much like *Pie-Man* from Penguin Software for the Apple.



Squeeze Box by U.S. Games for the Atari VCS.

M.A.D. stands for missile attack and defense and is a tough game, as is *Commando Raid* in which you must battle android paratroopers. Other games include *Eggomania* (along the lines of *Kaboom* but with a humorous twist), *Raft Rider, Entombed,* and *Towering Inferno.*

Spectra Video announced several new Spectravision VCS cartridges including *Master Builder,* a two-player game that pits you against the elements in the completion of a building; *Galactic Tactic,* a shoot-'em-up; and *Mangia,* a humorous game in which you must dispose of Mom's good pasta by eating it, feeding it to the dog, or throwing it out the window.

Spectra Video also showed a "true" 3-D game, *Vortex,* for the VCS, Atari computers, Vic 20 and TI 99/4A. To play, you must don special glasses with a red and blue lens (remember the 3-D movies of old?) and navigate your ship through a meteor shower while defending yourself from alien attack ships. A neat concept.

Mr. Bill's Neighborhood will be coming soon from Data Age.

The envelope please.

Best Licensed Character Without a Product Award

This award goes to **Data Age** for licensing Mr. Bill. At the press conference, Mr. Bill spoke and, in an unplanned drop off the podium, broke his arm off. Shades of Sluggo. Well, Mr. Bill, Sluggo, Sally, and Mr. Hands are all supposed to be in this new game from Data Age. The only catch—it doesn't yet exist. But we have confidence that it soon will.

More tangible new games from Data Age include *Journey Escape* in which you must safely guide the five members of America's hottest rock 'n roll band through the continuous onslaught of groupies, promoters, photographers, and more. In *Bermuda Triangle* you must navigate around the Bermuda Triangle in your mini-sub collecting artifacts and blasting hazards. *Frankenstein's Monster* is a tough game in which you must get stones from the basement of the castle and bring them to the top to build a barricade around the monster.

Tiger announced four new VCS titles including the clever and popular Atari computer game, *Miner 2049er.* Also from Tiger are *River Patrol* in which you must save drowning people while avoiding hazards in the river; *Polaris,* a game with multiple screens for missile launching and navigation; and *Springer,* a strategy game in which you must guide a jumping rabbit from cloud to cloud collecting treasures and avoiding hazards.

Sega, a major force in coin-op games (Turbo, Frogger, Zaxxon, Carnival) has teamed up with Paramount (Star Trek, Airplane, Marathon Man, etc.) to form what is potentially one of the most po-

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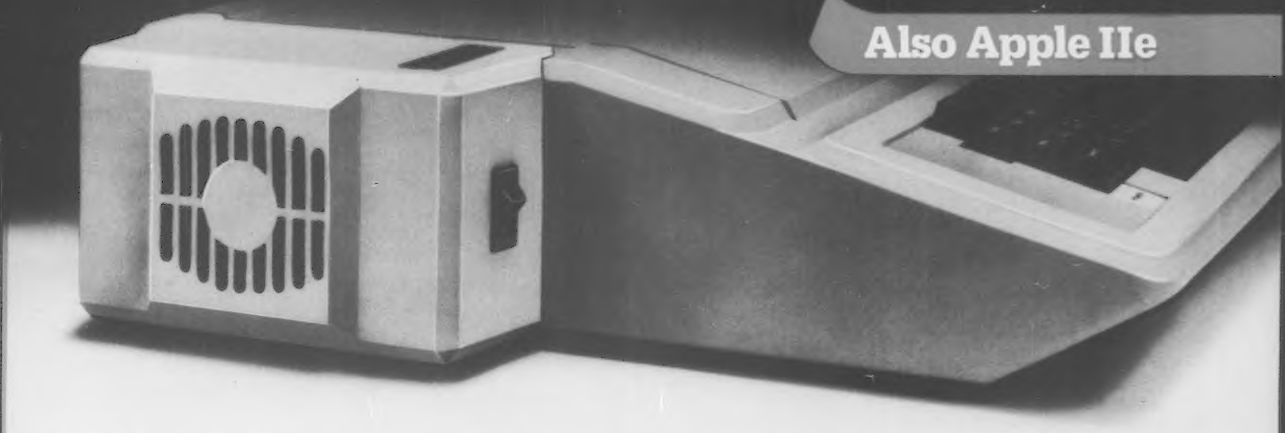
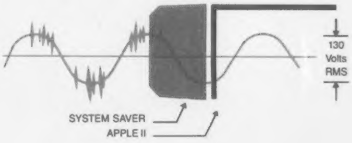


For Line Surge Suppression

The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.



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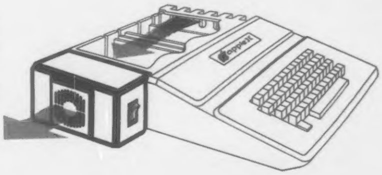

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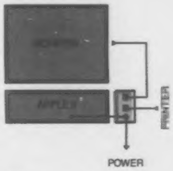

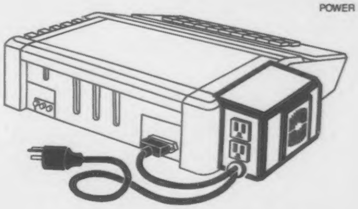

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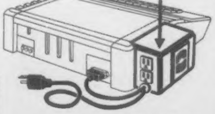

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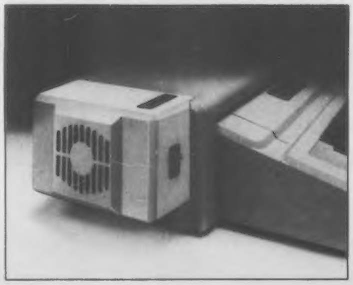

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CIRCLE 199 ON READER SERVICE CARD

CES, continued...

tent forces in video games. Sega has already licensed some games such as Frogger, Zaxxon, and Carnival to other game producers, but is now entering the market with a line of their own. Initial releases include *Subterfuge,* and *Buck Rogers' Marathon of Zenda, The Caverns of Zagreb,* and *The Secrets of Zadar. Muffett* is a cute cartoon game and *Airplane* is also based on a humorous theme.

Other games based on movies include *Marathon Man, War of the Worlds, Friday the 13th, The Wrath of Khan,* and *In Search of Spock.*

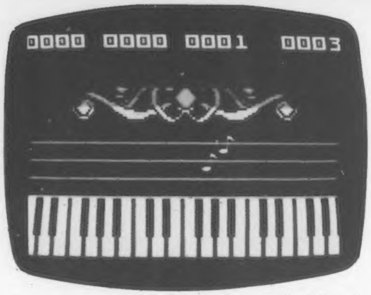
Konami is a major Japanese developer of coin-op games, most of which are licensed to other manufacturers to produce. Now, **Gakken,** another Japanese company, has licensed three Konami games for VCS cartridges, PooYan, Jungler, and Strategy X. Of the three, *PooYan* is the cutest; you move a mother pig up and down on a lift at the side of the screen and she shoots arrows into the balloons of ascending wolves. We found it quite addictive.

Starpath showed three new games, two of which use the proprietary Multi Load system. Starpath games require a device called a Supercharger which plugs into the game cartridge slot on the VCS and hooks to a standard cassette tape recorder. In addition to loading games, the Supercharger has 6K of memory, a dramatic increase over the 128 bytes built into the VCS. This allows impressive high resolution graphics and more complex games.

Now Starpath has gone one step further and put a series of games on a single cassette, each one of which adds new characters, scoring, objectives and levels of difficulty. *Dragonstomper* is a Multi Load game in which the player must first travel through a medieval land gathering gold, strength, and wares. He then goes on to a desert (second load), and to the dragon's cavern (third load). The other Multi Load games is *Escape from the Mindmaster* which is a 3-D maze game similar to *Way Out* from Sirius for the Apple. Let's take a breather for another award.

Best T-Shirt Award

Actually, it is the only T-shirt award and it goes to **Starpath** for their Killer Satellites T-shirt. It is really gruesome with an grayish olive satellite shaped like a skull on a black shirt. The game is a complex one in which you are defending Mother Earth (of course) from nasty killer satellites. You must evade meteors, blast the satellites, preserve your fuel, and keep your engines from overheating. Whew!



Astromusic plays on the expanded Intellivision.

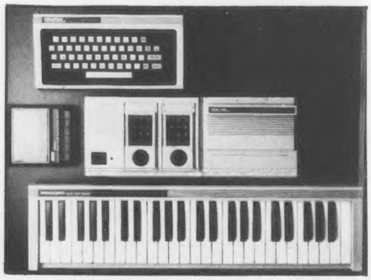
Not to be outdone by Atari, **Mattel** introduced an enormous number of new games, add-ons, and other enhancements for Intellivision. In the way of hardware, Mattel introduced new packaging, calling it Intellivision II. Distinguishing it from the original unit are longer controller cables, easier cable stowage, an off/on indicator lamp, and some engineering modifications.

Perhaps more exciting was the sneak preview of Intellivision III, a privilege granted to selected members of the press. We're committed to secrecy, but at least one gentlemen was heard to mutter, "it'll blow Atari and Coleco right out of the water." Our opinion is that other manufacturers probably aren't going to wait around to be blown out of the water.

More tangible are several add-ons announced for the existing Intellivision. First is an adapter to allow Intellivision to play Atari VCS cartridges. Second is a computer adapter. This has an additional 2K of RAM and 12K of ROM which includes Basic. It also has an interface to accept other peripherals, the most improtant of which is a 49-key full stroke keyboard. A program expansion module contains 8K extended Basic and 16K of user RAM.

Another kind of keyboard similar to a piano has 49 keys, and controls a six-note polyphonic music synthesizer.

In support of these add-ons, Mattel also announced a wide range of software in four categories: education, Basic programming, music, and super games.



Alphanumeric and music keyboards with Intellivision II.

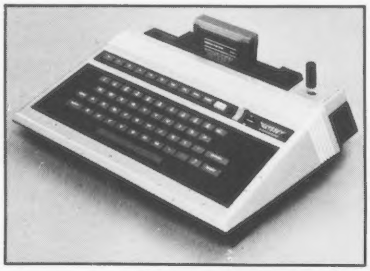
We didn't think much of the 12 lines x 20 character resolution for text, but some of the other software borders on the fantastic, particularly that for music.

In the past, we've had a tough time getting products for evaluation from Mattel. That's why you have never seen an evaluation of Intellivision on these pages.But we'll try again and keep you posted. In return, we present Mattel with our

Are You Afraid of an Evaluation? Award

Mattel also introduced 12 new Intellivision games including *Buzz Bombers, BurgerTime, Loco-Motion, Mission X, Advanced Dungeons & Dragons* and seven more. Several use the Intellivoice module and are almost scary in the way they converse with you.

N.A.P. Consumer Electronics (formerly Magnavox) introduced the Odyssey Command Center which replaces the membrane keyboard on the Odyssey² with typewriter-like keys. This seems to be in anticipation of a computer programming module to be released in the future, but it is also handy to use with the new telecommunications module (modem).



Odyssey Command Center has typewriter-like keys.

The modem allows the Odyssey Command Center to access information networks such as The Source and Micronet as well as communicate (in a rudimentary way) with other computers.

N.A.P. also introduced several new games for both old and new Odyssey systems, one of which garnered our

Most Annoying Tune Award

This award goes to *Turtles,* a delightful game in which you rescue baby turtles and use bug bombs to stop the predator beetles. The original Konami coin-op game plays a nice little tune as you make your rounds. Even the Entex handheld version plays the same cute tune, albeit several octaves higher. But on Odyssey, the tune is "sung" by the Odyssey Voice unit in a nasal deep bass voice. It's enough to make you cringe.

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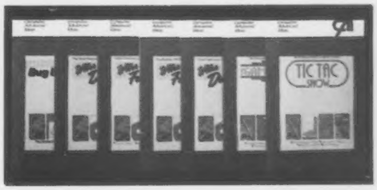

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Other new Odyssey games include *Pick Axe Pete, Freedom Fighters, Attack of the Timelord* (Dave's favorite), *Killer Bees, Baseball* and *Smithereens* (phenomenal graphics).

Perhaps the game companies figure that you are nothing if you don't have a simulated voice unit. Hopping on the voice bandwagon is **Vectrex**, but the approach is entirely different from the others. In particular, the *Spike* game cartridge contains the software to let the Vectrex unit itself "speak." Spike talks to you as you try to rescue his girlfriend Molly from arch fiend Spud. It's quite a departure from the current Vectrex games.

Other new ones for this amazing self-contained vector graphics system include *Web Warp, Bedlam, Fortress of Narzoid, Flip Out Pinball,* and *Heads-Up Soccer.*

Coleco had virtually their entire booth devoted to ColecoVision, and with good reason. With the VCS adapter, this system has got to be the most versatile one around. New games included *Donkey Kong Jr.,* and *Rocky Battles for ColecoVision* and several for Intellivision. Not that all is roses, however, since the Coleco controller is the pits. We usually plug in a decent Atari-type controller (D-Zyne SuprStick or the Newport joystick) and double the scores we can get on *Lady Bug* with the Coleco toy control. Nevertheless, ColecoVision is great. It is then, with mixed feelings that we present to Coleco the

Worst Controller for a Great System Award

Another new game system called CreatiVision was announced by Hong Kong based **Video Technology.** The specifications are excellent as is the price. However, we have found from bitter experience that these systems sometimes just don't get into the retail market. Let's hope that this one does since, in addition to being an excellent game unit, it can expand into a full-fledged computer system. We'll report further when we get a production model.

Atari Kid's controller for the VCS.

Emerson was also showing some new games for their Arcadia 2001 unit, but, like Mattel, Emerson has been unwilling or too disorganized to lend us a unit for evaluation. We asked again at the show for a loaner; we'll see.

Before we move away from the game manufacturers, we should present an award which must be shared by two companies. It is the

Back From Bankruptcy Award

This is shared by **Astrocade** and **Apollo,** both of whom had some financial problems but at the show looked as robust and energetic as ever. Perhaps "lean but mean" would be a better description. Our best wishes to both companies.

Game Controls, Trak Balls and Other Accessories

So you've got all these games and the cartridge slot on your VCS is showing signs of wear—some of the games are too. For around $60 you can get a Videoplexer from **Compro Electronics.** It plugs into the VCS—there is an Intellivision version too—and eight games plug into it. Each game can be selected from the membrane keyboard on the front. Now you can leave in a few favorites and plug the less frequently used games in the back slots. Neat, eh?

Love that trak-ball controller on Centipede? So do we. Several years ago, we were in the Atari R & D center and saw some prototype trak-ball controllers. Some were the size of grapefruit, others were smaller than golf balls. At the time, we kind of understood the concept when they explained it, but couldn't really see the advantage. So we won't even try to explain a trak-ball in words. If you don't know what one is, take a handful of quarters and play Centipede or Kickman, then come back to this. Now you see why everyone is rushing to get trak-balls into production for home use.

At CES, four manufacturers were showing trak-ball controls. Actually, only **Atari** can use the trademarked trak-ball name; the others must call them track balls. Atari was showing a trak-ball for both the 5200 (in an all-in-one game control center) and the 2600 VCS. We can see why the release date isn't until mid-year; while they both had great feel, they also occasionally hung up the game that was being played. We were going for an all-time high score (for us) in *Centipede* when the game hung up and had to be restarted.

Trak-ball controller for the Atari 5200.

Atari also introduced a kid's controller to go with a the CCW educational game series. Basically the controller is a 12-key 5 × 7-inch keyboard. Each game comes with a special pictorial overlay.

Atari also promises us an improved Proline Joystick to replace the existing stick—but not until June or later. Can't wait? That's okay; there are plenty of other excellent sticks on the market. Many were discussed in our roundup in the September issue and some new ones are mentioned below. Or, if you have a sick Atari joystick, Atari just announced a joystick repair kit. Also, most Atari dealers will have a test console to diagnose VCS problems—kind of like the tube checkers in many electronics retailers years ago. Meanwhile, back to trak-balls.

TG introduced the TB-600 Track Ball which, according to their literature, "is modeled after the $1200 Track Balls used to train U.S. astronauts." Well, maybe, but we suspect that the coin-op arcade games may have had a small influence too. The action is much stiffer than that of the Atari unit, but once you get used to it, you find that you can adjust. The TG unit electrically simulates a joystick, hence it can be used in place of a joystick (potentiometer type) on Apple and IBM computer games. We are promised a version shortly for Atari and

TG Track Ball controller for Apple, Atari and IBM computers.

Vic 20 computers, the Atari VCS and NEC PC-6000. At a retail price of only $64.95, we can't wait.

TG also introduced an improved model of their first joystick. This one has a pair of pushbuttons on the top panel that can be used to defeat or turn on the auto self-centering. Very nice.

Is it time for another award? Sure is. This one is the

Best Track Ball Without Software Award

It goes to **Wico Corporation** for their Command Control Trackball. It is a marvelous unit with an optical scanner, microprocessor and solid steel bearings. Wico, as a major manufacturer of coin-op game controls, has made their home track ball unit along similar lines. Only one problem. Nobody is writing software for such a unit. Wico hopes they will someday, but today there is not a great deal of use for this unit.

Wico analog joystick is available for many computers.

Not so for the Wico line of joysticks. Wico makes a broad line of top quality joysticks for the Apple, Atari, Vic 20, TRS-80 Color Computer, IBM PC, and Atari 5200. They boast top firing buttons, contoured handgrips, interchangeable grips and the like—most impressive. Watch for our playtesting of the Wico controls in an upcoming issue.

Another Track Ball was introduced by **HAL Laboratory.** It gets our

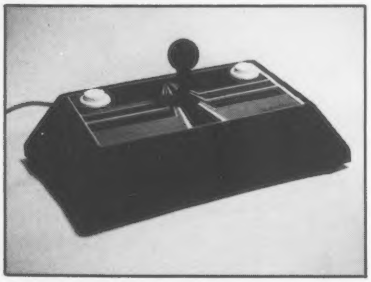
Worst Translation Award

The GTX Track-Ball is available for the Apple and Vic. HAL, a Japanese company, also makes "softwares for game" and a programmable character generator for CBM and Pet computers. Here is the description of this product direct from their flyer. "Generally, the personal computer has been equipped inside (character generator) as ROM. and it generates some fixed characters like A,B,C, . . .and etc. whenever to be supplied the power, so that if to be put RAM in place of ROM, it will be sure to make the ability of the personal computer more flexible, and also it enable the personal computer to display freely various character patterns such as Alphabet, Japan-ese, Video game use character and so on." It goes on, but we won't. Hope their track ball works.

In addition to Wico, several other manufacturers of coin-op game controls are moving into the home market. **Coin Controls, Inc.** introduced the Competition-Pro Joystick while **Newport** showed improved versions of the controls we liked so much in our test last September. **Questar Controls** also introduced a line of controls and repair parts, one of which takes an award.

Joystick Bigger Than the Computer Award

Three joystick console controls from Questar measure a gargantuan 12-$^1/_2$ x 8 x 3 inches. This isn't as bad as it sounds. If you play like we do, your left hand gets a real workout from holding the joystick still while the right hand does the maneuvering (or vice versa). This control stays put; we like that. Also, the Questar units have big 1" diameter firing buttons; we like that too. Joe Vermeren gave us one to try out; watch for a review in an upcoming issue.



Questar II Joystick console.

Another nifty device announced by Questar is an automatic rapid fire module. This plugs in between the joystick and game and can be set for any rate of continuous rapid fire. This is very useful for annihilating aliens with a continuous beam of devastation.

Another continuous fire control, but with a non-adjustable rate of fire was announced by **Discwasher.** Discwasher? Aren't they the record care folks? Yes, but they have seen the light and have brought to market the PointMaster Pro tournament joystick with thumb trigger firing button and contoured handgrip along with the PointMaster Fire Control. David Howe gave us one of each; watch these pages for an in-depth evaluation.

Zircon has improved the design of their Video Command handheld joystick with the addition of a continuous fire button built right in to the control handle. Tom Larsen, Zircon's friendly VP of sales gave us a sample so we'll have a real test coming up soon.

Electra Concepts also showed a new joystick with an index finger trigger and contoured grip. We hope to try it soon also.

Kraft Atari-type joystick features fingertip control.

Our friends at **Kraft** have gone a different route with a fast action, short throw Atari-type joystick with a small fingertip control similar to that on the Kraft Apple joystick. You'll recall from the September issue that we liked the Kraft joystick with its adjustable x and y axis trim controls and switches to select either self-centering or free-floating operation.

Human Engineered Software, a maker of Vic 20 software, introduced the Hestick I for Atari, Vic and other similar units. It has sleek styling and the price is right ($7.95). When we get one, we'll let you know how it performs in tough game play.

Kraft also introduced an Apple software disk that permits a joystick to control the movement of the cursor in *VisiCalc* calculations. This is a real joy as it eliminates the need to press the spacebar constantly to change the direction of cursor movement. The program adds some other enhancements as well; watch for a complete review.

Earl Laskey Video introduced a ColecoVision replacement joystick which, as we said above, is really needed. It is not a total unit; rather it simply replaces the joystick portion of the Coleco unit just like Laskey's conversion for Intellivision, the Injoy-A-Stick. When we get one, we'll let you know how it is.

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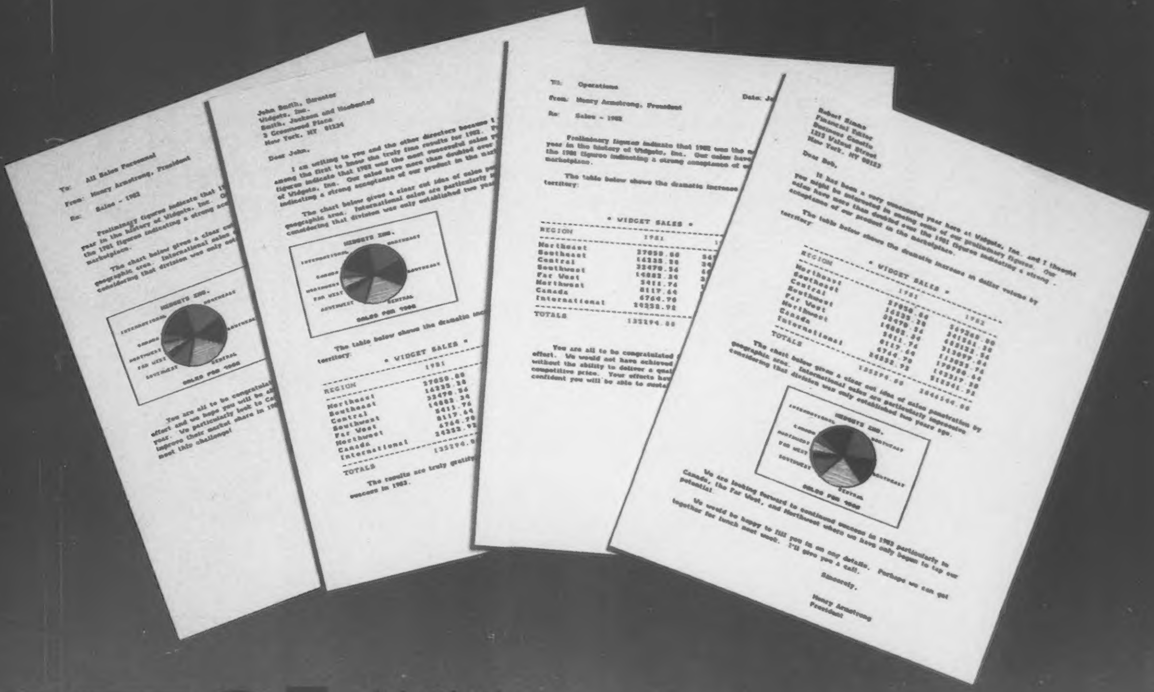

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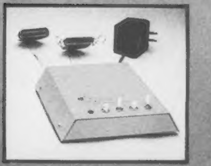

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CES, continued...

Turn Your VCS Into a Computer

The vogue among many manufacturers today seems to be to offer a dual purpose system (video game player and a computer)—witness Intellivision II, the Odyssey Command Center, CreatiVision, and others. Frankly, we don't think this makes much sense. Given the low price of game systems and computers (more of which later), we think most people can afford, and would be better off getting, both a game system and one or more computers.

However, it seems that some manufacturers feel otherwise. And naturally the main target for third party conversions is the Atari VCS. No fewer than four units were announced to convert the VCS into a real computer.

Entex announced the 2000 Piggyback. It has a big 70-key full stroke keyboard, 3K of RAM (expandable to 19K), and built-in Basic. Ten educationally-oriented software packages were also announced including *Speed Reading, Beginning Algebra, Number Games* and *Spelling I.* Expected retail price is around $130.

Unitronics showed a two-step expansion system. The Expander has 16K of RAM and a tape cassette mechanism to permit loading cassette games into the VCS much like the Starpath Supercharger (but, of course, the games aren't compatible). The second unit is a 55-key keyboard. A few games for the system were shown, but unfortunately, very little hard information was available about the system.

Spectra Video announced the CompuMate which sits on top of a VCS and converts it into a computer. CompuMate has a 42-key touch sensitive keyboard, 2K of RAM, cassette interface, built-in Magic Easel program for drawing pictures, and built-in music composer program with two octave/two channel capability. Projected retail is $100.

Emerson was showing a prototype all-in-one unit with 16K of RAM, 57-key full-stroke keyboard plus a 2-key numeric/control keypad, sound/voice synthesizer, built-in Basic, cassette, disk and printer interfaces, and, best of all, the ability to run Atari 400/800 software. Memory is expandable to 48K. Projected price is under $150.

On Feb. 9, Atari announced their own VCS computer add-on; see page 276.

So You Want To Write Your Own VCS Games

If you want to write games for the VCS, you can go the low road or the high road. The low road is a PGP-1 from **Answer Software Corporation.** Like the four VCS-computer converters described above, the PGP-1 plugs into the Atari VCS. You then plug any VCS game into the PGP-1 and you can modify it in practically any way you want. No, it's not Basic since games are programmed in 6502 machine code, but by following the relatively straightforward directions on the screen and in the manual, you can change the patterns of alien movement, alter mazes, and add elements of your own. The game cartridge, of course, is not changed and, at the moment, there is no way of storing your finished game.

Answer Software also announced a new game, *Malagai,* a Pac-maze type of game with several interesting twists.

Frobco announced the Frob-26 game development system. It consists of a card to plug into an Apple computer, an in-circuit emulation cable that plugs into the VCS, two prototype VCS cartridges, a disk, and a reference manual. The software has three main components: a real-time debugger, the "Explorer" which lets you control all the VCS hardware registers in real-time, and a set of utility subroutines. Price for the Frob-26 system is $495.

Ed Krakauer, president of General Consumer Electronics and Betsy Staples, editor of Creative Computing. We presented an award to GCE for making two games (Vectrex and Game Time Watch) that were used in the Gamester of the Year competition sponsored by Video & Arcade Games *magazine.*

INMAC PLUS
the frob
the frob

The Frob system lets you develop VCS games on an Apple.

A game development system for the Atari 5200, expanded memory systems, EPROM burners, and other related components are also available from Frobco.

Entex 2000 Piggyback turns a VCS into a computer.

ENTEX 2000 PIGGY BACK

Unitronics' VCS Expander includes a cassette loader/memory unit and a keyboard.

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There are more programs available for the COMPAQ Computer than for any other portable. More, in fact, than for most nonportables. You can buy them in hundreds of computer stores nationwide, and they run as is, right off the shelf.

With most other portables you'd probably need to buy an additional display screen because the built-in screen is too small for certain tasks, like word processing. The COMPAQ Computer's display screen is nine inches diagonally, big enough for any job, and it shows a full 80 characters across. And the built-in display offers high-resolution graphics and text characters on the same screen.

The bottom line is this. The COMPAQ Computer is the first uncompromising portable computer. It delivers all the advantages of portability without trading off any computing power capability.

And what do those advantages cost?

Nothing.

The COMPAQ Portable sells for hundreds less than a comparably equipped IBM or APPLE® III. Standard features include 128K bytes of internal memory and a 320K-byte disk drive, both of which are extra-cost options on the IBM. Memory and additional disk drive upgrades are available options to double those capacities.

In the standard configuration, the COMPAQ Computer has three open slots for functional expansion electronics as your needs and applications grow. It accepts standard network and communications interfaces including ETHERNET™ and OMNINET™.

If you're considering a personal computer, there's a new question you need to ask yourself. Why buy a computer that *isn't* portable?

For more information on the COMPAQ Portable Computer and the location of the Authorized Dealer nearest you, write us. COMPAQ Computer Corporation, 12330 Perry Road, Houston, Texas 77070. Or call 1-800-231-9966. In Texas call 1-800-392-4726.

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OMNINET™ is a trademark of Corvus Systems.
Apple® is a registered trademark of Apple Computer, Inc.
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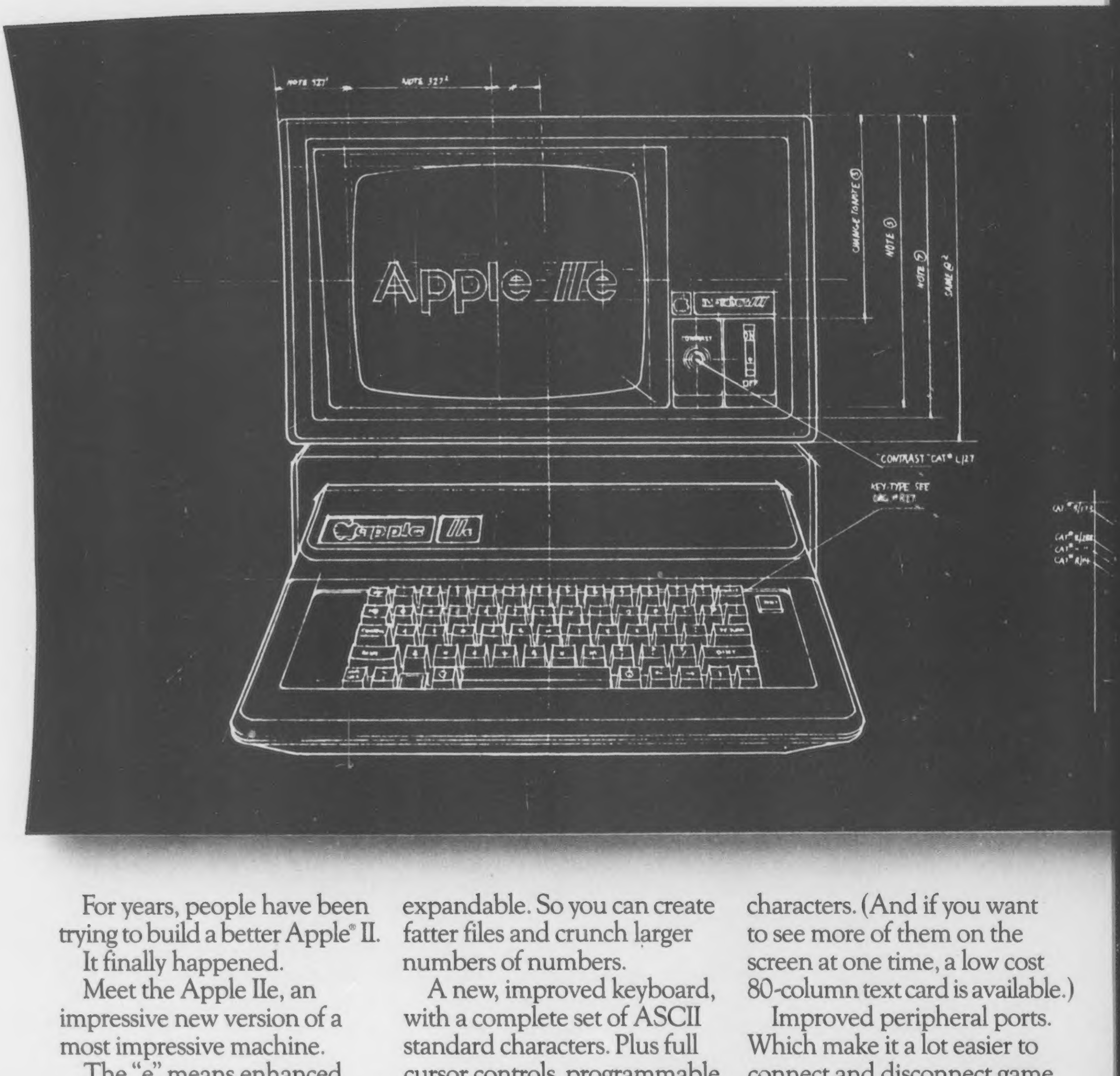
COMPAQ™
Portable Computer

The most computer you can carry.

CIRCLE 139 ON READER SERVICE CARD

It's the same old Apple II.


NOTE 327¹
NOTE 327²
Apple //e
CHANGE TO NOTE ③
NOTE ③
NOTE ⑦
SAME @²
CONTRAST
ON
OFF
"CONTRAST "CAT# L127
KEY-TYPE SEE DWG #R17
apple //e

For years, people have been trying to build a better Apple® II.

It finally happened.

Meet the Apple IIe, an impressive new version of a most impressive machine.

The "e" means enhanced. Which means a bundle of new features:

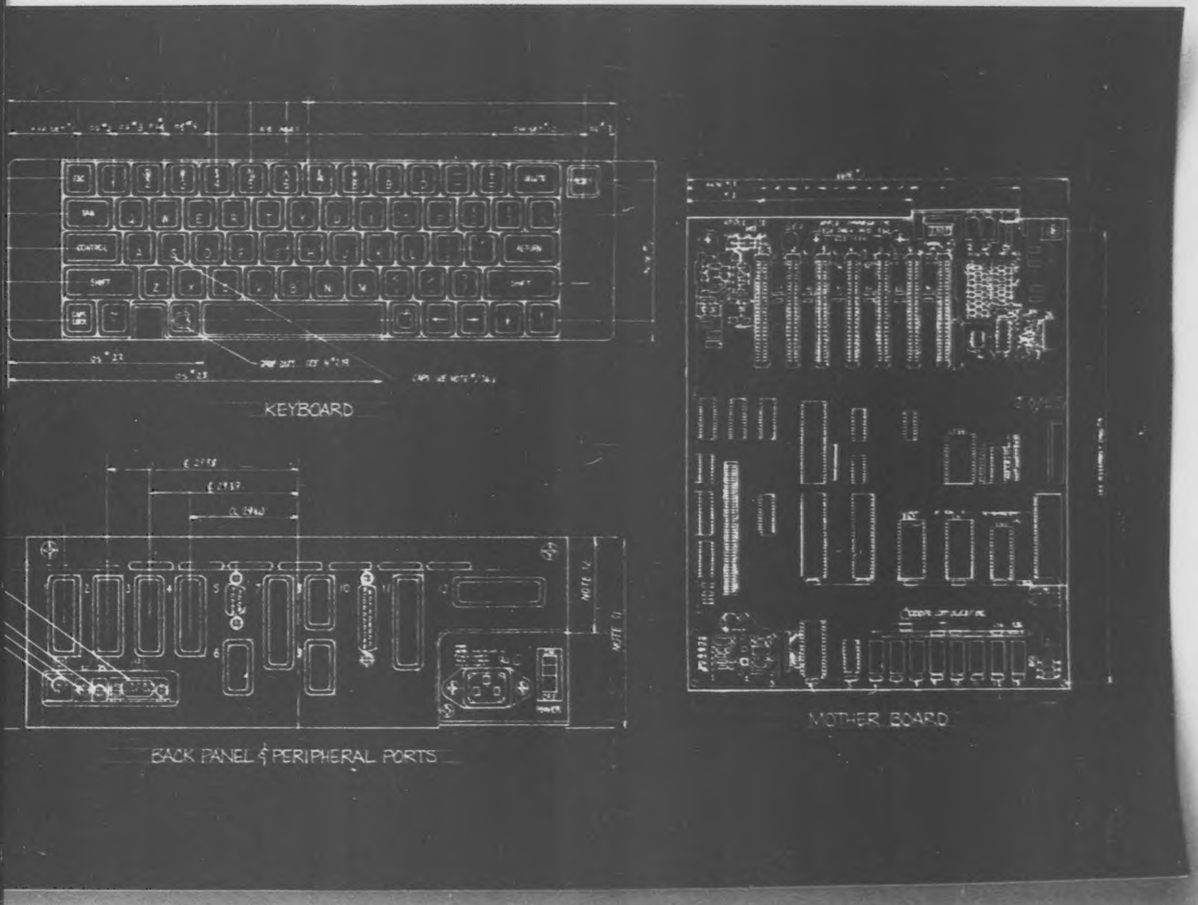
A standard memory of 64K (versus 48K) that's easily expandable. So you can create fatter files and crunch larger numbers of numbers.

A new, improved keyboard, with a complete set of ASCII standard characters. Plus full cursor controls, programmable function keys, and a rapid auto-repeat feature built into every key on the board.

Both upper and lower case characters. (And if you want to see more of them on the screen at one time, a low cost 80-column text card is available.)

Improved peripheral ports. Which make it a lot easier to connect and disconnect game controllers, printers and all those other wonderful things that go with an Apple Personal Computer.

Except for the front, back and inside.



Self-diagnostics. That's a special feature that makes it easy to give your computer a thorough check-up.

Plus an even more reliable design. Achieved by reducing the number of components—which is to say, the number of things that could go wrong.

And bear in mind, the IIe still has all those other virtues that made the Apple II so very popular. Including access to more accessories, peripheral devices and software than any other personal computer you can buy.

So visit any of our over 1300 authorized dealers, and see the newest Apple for yourself.

Like the original, it's rather extraordinary. But then some things never change.

apple®
The most personal computer.

Call **(800) 538-9696** for the location of the authorized Apple dealer nearest you, or for information regarding corporate purchases through our National Account Program. In California **(800) 662-9238.** Or write Apple Computer Inc., Advertising and Promotion Dept., 20525 Mariani Ave., Cupertino, CA 95014. ©1983 Apple Computer Inc.

CIRCLE 108 ON READER SERVICE CARD

Mabel, You Won't Believe These Computer Prices

The first day and a half at CES, we hardly got out of our own booth. Every so often, someone would come by and say, "Didja see the new (fill in the blank) computer? It's just $150." (Or $100, or $199, etc.) Our mouths were watering by the time we finally got out on the show floor. And with good reason.

When the dust finally settled, we counted four new computers under $100, three more under $200, two under $300, one at $349, and several more under $1000. Add this to the existing units under $1000 and you are faced with a bewildering array of choices. Our opinion is that it won't be long before people recognize the advantage of having several computers, one for each family member or one for each application.

For example, we do word processing and spreadsheet calculations on one computer, use a battery-powered unit when we travel, have two computers for games, and still another for the kids. With the prices continuing to plummet, it won't be long before people in all walks of life (and not just those in the industry) can afford multiple computers and game systems.

With the more-or-less permanent $15 rebate, the **Timex Sinclair** 1000 is still the low priced leader (suggested list $100 less $15 rebate equals $85). Common street price in the New York area is closer to $70 after the rebate.

A Sinclair look-alike called the Futura 8300 was announced by **Unisonic.** It gets two(!) awards.

License? What License? Award

Since this is an exact clone of the Timex Sinclair 1000, we asked the Chinese manufacturer if they were licensed by Sinclair to offer the same Basic. "No, why should we be?" The main improvement on the Futura compared to the 1000 is that it has real keys instead of a membrane keyboard. That's nice. So is the price—expected to be around $90.

Support is another story. We asked a gentleman from Unisonic whom we should contact for more information. His annoyed reply was, "We don't have anyone to deal with the press."

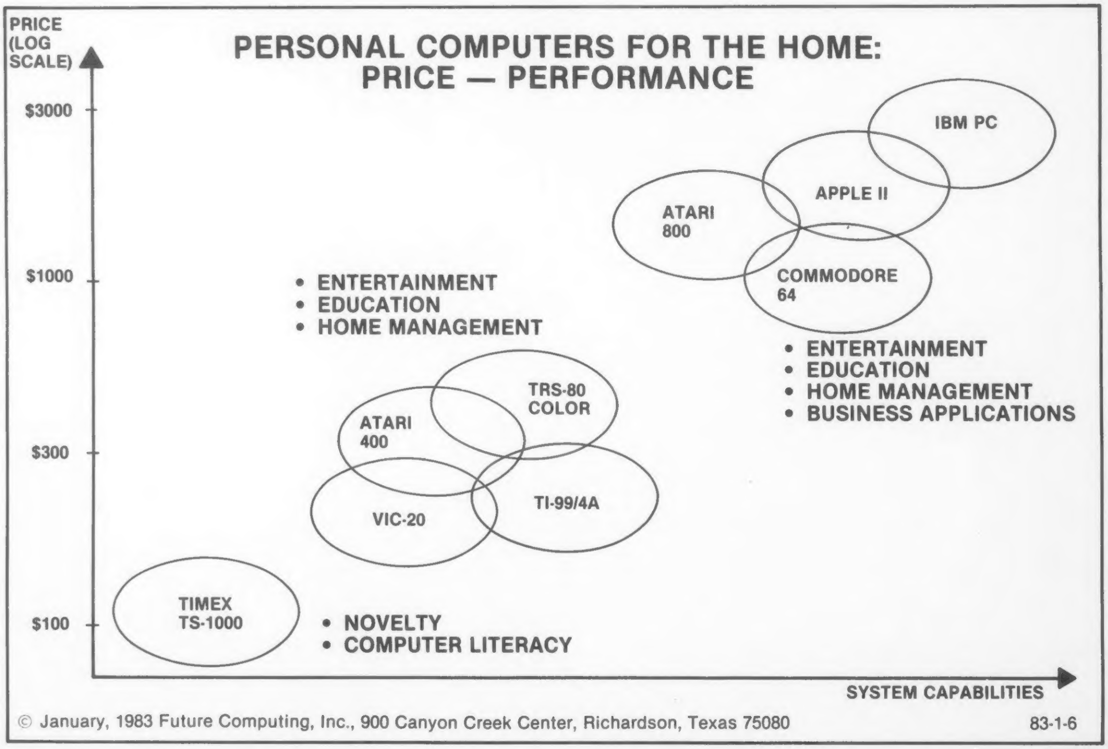
"How can we get a unit for evaluation?" We asked, reminding him that we publish *SYNC* magazine. "Buy one," he said as he walked away. Thus, we give Unisonic our

Support? What Support? Award

However, if Unisonic is doing things wrong, **Texas Instruments** is doing them right. The newly introduced TI 99/2 computer is nicely styled, has a TI-9995 16-bit mpu, 4.2K of RAM, a whopping 24K of ROM with TI Basic, and 16 built-in graphics characters. Support is unbelievable for a new product and thus TI gets our

Best Support For a New Product Award

No fewer than 19 software packages



© January, 1983 Future Computing, Inc., 900 Canyon Creek Center, Richardson, Texas 75080 83-1-6

This chart shows two gaps in the continuum of price and performance of computers, one at around $200 and another at $700-800. The lower gap was totally erased by the new machines introduced at CES. With seven computers under $200 and the announcement of Vic and Atari price reductions, there is continuous overlap from $65 to $600. The price reduction on the Atari 800 and the new Atari 1200XL fall in the upper gap, however, we expect to see more entries before long.

The chart is from Future Views ($365 per year), 900 Canyon Creek Road, Richardson, TX 75080.

FRANKLIN'S BAKER'S DOZEN!

13 Good Reasons to Buy the ACE 1200

1. Apple® II-compatible
2. CP/M®-compatible
3. 128K of RAM
4. Built-in floppy disk drive
5. Disk controller
6. 80 column card
7. Serial interface
8. Parallel interface
9. Upper and lower case
10. VisiCalc® keys
11. Cursor control pad
12. Numeric pad
13. Auto repeat keys

Extras can more than double the price of your personal computer. Not so with the Franklin ACE 1200. It's the professional computer system that includes the extras—and a long list of exclusive Franklin features that make it the most extraordinary value on the market today.

The ACE 1200 has everything you'll need to add a color or black and white monitor, modem, printer, back-up disk drive and other accessories. You can choose from the enormous selection of Apple programs and peripherals because the ACE 1200 is hardware- and software-compatible with the Apple II. And, with the built-in CP/M card, you can run both Apple II and CP/M programs. Franklin's CP/M operates three times as fast as many competing systems, drastically reducing processing time for most business applications.

The Franklin ACE 1200—the most extraordinary value on the market today. Call or write today for the name of your local authorized Franklin dealer.

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VisiCalc is a registered trademark of Visi Corp.

FRANKLIN
COMPUTER CORPORATION

7030 Colonial Highway, Pennsauken, NJ 08109 609-488-1700

CIRCLE 168 ON READER SERVICE CARD

TI 99/2 computer sells for $100.

were announced for the 99/2 in three areas: entertainment, education, and information management. We are very impressed with the 99/2 in all respects except one. And for that one, we give TI our

Rubber Keybounce Award

It was probably because the units at the show were prototypes, but it was quite impossible to type with any speed due to the keybounce. One would think that TI would have learned their lesson about yucky keyboards after the debacle with the original 99/4 keyboard, but we'll give them the benefit of the doubt on this one and trust that production units will be better than the prototypes. Price of the 99/2 is a delightful $100.

TI introduced a second new computer, the Compact Computer 40 (CC-40), a unit aimed at the professional user. Like the Epson HX-20, the CC-40 has an integrated LCD display (only 31 characters) and runs on batteries (200 hours on four alkaline AA cells). The CC-40 has 34K of ROM with extended Basic, 6K of RAM (expandable to 128K thanks to the 16-bit processor), a 65-key keyboard (no keybounce on this one), and a full range of peripherals (usable on both the CC-40 and 99/2). Price of the CC-40 is $249.95.

The peripherals require the addition of a Hex-bus peripheral interface. The peripherals being shown included an RS-232 interface ($100), printer/plotter with four-color capability on 2-½" paper ($200), and Wafertape digital tape drive similar to the Exatron Stringy Floppy ($139).

TI CC-40 computer is aimed at professionals.

Again, software support is excellent with 22 packages being announced at the show. Eight were solid state plug-in cartridges and 14 were on Wafertape. Prices range from $19.95 to $124.95. Another 75 packages are promised by the third quarter of 1983.

Milton Bradley voice recognition unit for TI 99/4A computer.

While we're talking about TI, we should mention the voice recognition peripheral for the TI 99/4A computer just announced by **Milton Bradley.** Jim O'Connell, M-B's vice president of R&D, pulled us into a soundproof booth, donned a headset and microphone (which come with the unit) and proceeded to train the computer how to play baseball. Initially, we were ready to give this our

Can't Tell First Base From Third Base Award

but Jim got it going so that he could direct a player to catch a ball and throw it to the right base. The unit comes with a 64-position key pad with overlays for each cartridge, a triple-axis joystick and a headset/microphone. No price as yet.

Hey, I really like this rubber computer!

Mattel Aquarius system includes computer, printer, recorder, expander and game controllers.

Mattel announced the Aquarius computer which, with 4K of RAM, is expected to sell for $200. The array of peripherals for Aquarius is impressive. Immediately available are a thermal printer, cassette data recorder, memory expanders, and an interface unit with a pair of game controllers. Eight more peripherals were announced for shipment in late 1983.

Aquarius uses a subset of Microsoft Basic and can also run several special Logo cartridges. Twelve game programs, four Logo programs and three household management programs were being demonstrated. Many more programs are in the planning stage, one of which should probably be dropped. We give it our

Typing Teachers Will Hate This Award

A typing tutor was announced for Aquarius. The only problem is that the computer uses those little rubber keys and does not have a space bar. Instead, there is a space key located on the bottom row next to the Z where you would expect to find a Shift key. The Shift key is located next to the A, and, in place of the right hand Shift, we find the Return key. It is not a fun keyboard for touch typists.

Sanyo was showing two prototype units, the PHC 20 for $99 and the PHC 25 for $199. Both use Microsoft Basic, although the PHC 20 uses a small subset while on the 25, it is much more complete. The other major difference between the two units is that the 25 has a high resolution display with eight colors and three sound channels while the 20 is a silent, low resolution, b&w unit. Unfortunately, we couldn't get as much information on the Sanyo computers as we would have liked since the designer was the only knowledgeable person in the booth, and he barely spoke English. Thus, we give Sanyo our

Not Quite Finished Award

Video Technology had a mini-booth, but a maxi-product, the VZ200. The unit has Microsoft Basic in a 12K ROM, 4K

Now available with RS-232 interface.
U.S. MARKET FORECAST-MICROS IN EDUCATION

How to chart your company's fortune without spending one

It's a fact. A single chart or graph can tell you instantly what it takes hours to interpret from printouts or other raw data.

Now, with the Strobe 100 Graphics Plotter and Software package, you can create superb hardcopy graphics directly from your computer. And you can do it for a fraction of the cost of most other systems.

The Strobe System transforms complex data into dynamic, colorful visuals with a few simple commands from your computer. Charts and transparencies that once took hours to produce are plotted within minutes. Information can be presented as bar charts, pie charts, curves or isometrics in a variety of colors. And with a resolution of 500 points per inch, the Strobe 100 matches or surpasses the quality of plotters costing thousands of dollars more.

You can also save and modify your graphics through Strobe's menu-driven programs. A broad selection of software—including data base management-compatible programs—is now available.

When the Strobe Graphics System is interfaced to your computer, an 8-1/2 x 11 inch sheet of paper can speak anyone's language—visually. Visit your local dealer and learn how to start charting your fortunes today. Because a perspective on the present can also be your window on the future.

STROBE
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Mountain View, CA 94043
Telephone 415/969-5130

The Strobe Graphics System

Seeing is believing

CIRCLE 286 ON READER SERVICE CARD

of RAM expandable to 64K, eight colors, and one sound channel. Although the screen is medium resolution (128 x 64 pixels), the 64 built-in graphics characters permit excellent graphics to be displayed. A built-in cassette interface and optional Centronics parallel interface help make VZ200 the sleeper of the show at just $99!

If you've been reading *Creative Computing* faithfully, you saw our in-depth review of the Sinclair Spectrum introduced in England about a year ago. Now, **Timex** has brought it to the U.S. as the Timex 2000. It carries a list price of $149 for the 16K model and $199 for the 48K one.

The 2000 is an outstanding computer with 40 real keys, eight-color high resolution display (256 x 192 pixels), ten-octave sound channel (one of us can't hear that much!), upper and lower case, and 16 graphics characters. Our only disappointment is that it does not have a space bar and thus, like the Aquarius, cannot be used for touch typing.

Timex also announced the 2040 printer, a 32-column thermal unit that uses white paper (not the silver stuff of the previous Sinclair printer). It works on both the 1000 and 2000 and costs $99.

At this point it is probably appropriate to announce the

We're Number 1 Award

Three manufacturers tried to lay claim to this award before we even announced it. Commodore, having just produced their 1,000,000th Vic 20 claimed to be Number 1. TI pooh-poohed that and claimed that the 99/4A had made them Number 1. Clive Sinclair was having none of it and claimed that he had been Number 1 for ages. Who is really Number 1?

New Computers	Unisonic Futura 8300	Texas Instruments 99/2	Video Technology VZ200	Sanyo PHC20
MPU	Z80A	9995	Z80A	Z80A
Built-in RAM Memory	2K	4.2K	4K	4K
Expandable To	32K	36.2K	64K	16K
Built-in ROM Memory	8K	24K	12K	8K
Type of Basic	Sinclair	TI	Microsoft	Microsoft
Number of Keys	42	48	45	56
Standard Layout?	No spcbar	Yes	No spcbar	Yes
One-Stroke Basic Cmds?	Yes	No	Yes	No
Upper and Lower Case	No	No	No	No
Graphics Characters	20	16	64	0
Text Resolution (Chars × Rows)	32 × 24	28 × 24	32 × 16	32 × 16
Resolution (Pixels)	64 × 48	256 × 192	128 × 64	64 × 64
Colors	B & W	B & W	8	B & W
Sound Channels	1	0	1	0
Octave Range	n/a	n/a	n/a	n/a
Cassette Baud Rate	250	1200	600	1200
Serial Ports (RS-232)	optional	Hex bus		0
Parallel Ports	n/a	Hex bus	optional	0
Parallel Protocol	n/a	TI	Centronics	n/a
Dimensions (Width × Depth × Height)	n/a	n/a	11.5× 6.3 × 2.0	11.8× 6.3 × 1.6
Retail Price	$90	$100	$99	$99

In terms of sheer number of units, Sinclair is if you add together those sold under both the Sinclair and Timex names (which we think is reasonable to do). If you insist on just one brand, then the Commodore Vic 20 is the leader. By next year, who can say? Maybe TI will claim the Number 1 spot.

IBM, of course, was keeping a low profile. However, we're sure they would insist that dollar volume is a better measure, in which case they are clearly it. Despite having a fair size booth, IBM was not the hit of CES. Quite the contrary, particularly since several trade magazines had predicted that IBM was about to release a consumer computer at CES (they didn't). One even went so far as to put it on the front page of their daily publication on the last day of CES. For this, they and IBM must share the

Computer? What Computer? Award

Back to Sinclair printers and peripherals. **Mindware** introduced one of the strangest devices at the show, the Sidewinder, a sideways printer for Sinclair computers. It is also available for the Vic 20, TI 99/4A, Atari and any computer with an RS-232 serial interface.

Sidewinder uses 1-$^3/_4$" adding machine paper with a dot matrix print mechanism that allows reproducing material wider than the computer display by generating a 12-line printout that runs lengthwise on the paper. Price of the MW-100 is just $139.95.

Data-assette showed several new add-ons and software packages for

Video Tech VZ200 is a great bargain at $99.

Timex 2000 computer.

TIMEX
2000
CAPS SHIFT
SPACE

Sanyo PHC25	Timex Sinclair 2000	Mattel Aquarius	Texas Instruments CC-40	Spectra Video SV-318	Panasonic JR-200
Z80A	Z80A	Z80A	9995	Z804	6802
16K	16K	4K	6K	32K	32K
48K	48K	52K	128K	128K	32K
24K	16K	8K	32K	32K	16K
Microsoft	Sinclair	Microsoft	TI	Microsoft	Microsoft
65	40	49	65	71	63
Yes	No spcbar	No spcbar	Yes	Yes	Yes
No	Yes	Yes	No	No	Yes
No	Yes	Yes	Yes	Yes	Yes
	16 (35)	170?	16	52	64
32 × 16	32 × 24	40 × 24	40 × 24	40 × 24	32 × 24
256 × 192	256 × 192	320 × 192	256 × 192	256 × 192	64 × 48
8	8	16	16	16	8
3	1	1 (2 opt)	3	3	3
n/a	10	n/a	n/a	8	5
1200	1500	1200	1200	300/1200	2400
optional		optional	Hex bus	1	optional
1	1	n/a	Hex bus	1	1
Centronics	Sinclair	n/a	n/a	n/a	Centronics
11.8×	9.2×	13.0×	9.5×	n/a	13.8×
6.3 × 2.0	5.6 × 1.2	6.0 × 2.0	5.7 × 1.0		8.2 × 2.2
$199	$149	$200	$249	$299	$349

Jupiter Ace speaks Forth, not Basic.

Timex/Sinclair computers (read all about them in the big *SYNC* directory issue). Also at their booth was the Jupiter Ace computer. While outwardly it resembles a Sinclair with real keys, inside it speaks Forth rather than Basic. Forth aficionados will tell you, usually with no prompting, that Forth is 10 times as fast as Basic, much more compact, and much more powerful. So it makes sense in a small computer like this one (3K).

Commodore was showing several new peripherals, most notably the Vic-1520 four-color printer/plotter with 20, 40, or 80 (tiny) characters per line. It prints sideways or lengthwise on 4-½" wide paper. Price $199. A speech synthesizer spoke to us as we walked by and several new software packages tried to attract our attention as we headed toward the crowd in the back of the booth.

There we found a Commodore 64 redesigned to fit in a portable case about half the size of an Osborne. It had a color display, was battery powered, and looked very inviting. It was just a prototype, but judging from the enthusiasm at the show, it should find its way into production in short order.

Commodore also announced a dealer price reduction on the Vic 20 which should have the effect of lowering the street price to $150, possibly less.

While we're talking about the Vic, we should mention that **Cardco** was showing two expansion boards (one with three slots and one with six), a cassette interface, a light pen, a printer interface, and, hold on to your hats, an adapter to allow the Vic to play Atari VCS cartridges. This latter device was shown with much secrecy in an out-of-the-way hotel room with a rent-a-guard at the door. It gets our

Best Protected Orange Cardboard Box Award

Housed, temporarily we were told, in an orange cardboard and Scotch tape box, the device plugs into the expansion connector on the back of the Vic and has a slot into which VCS cartridges are plugged. It also brings the Vic connector out the back for added memory, etc. The Vic function keys take the place of the VCS switches and the whole thing works like a charm. Price is $89.95.

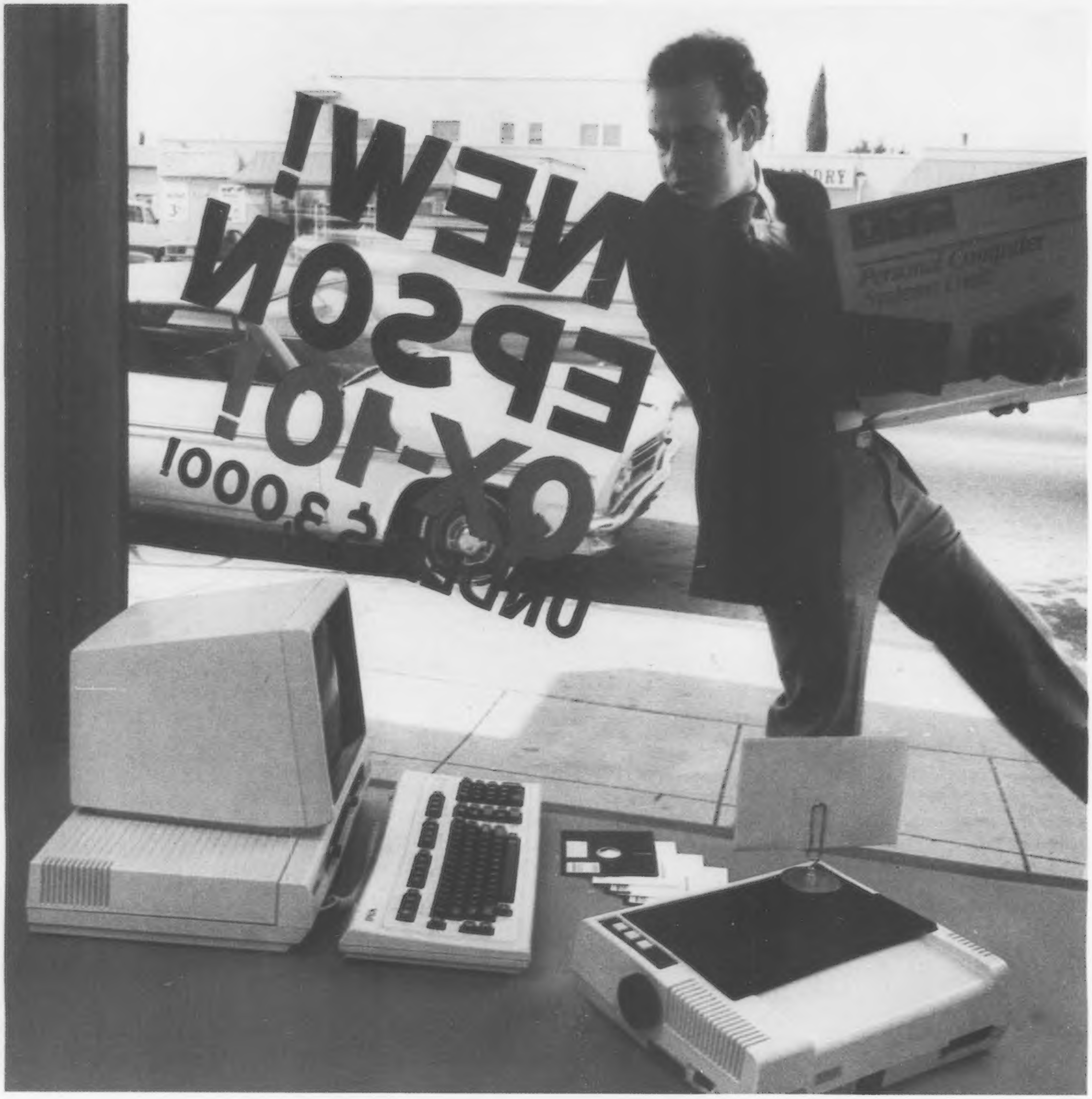
Spectra Video introduced a new computer, the SV-318, with 32K, Microsoft Basic, CP/M compatibility, 71-key full stroke keyboard, high resolution (256 x 192 pixels) 16-color graphics, and three-channel music synthesizer—all for $299. For this feat, we award them our

Most Bang For the Buck Award

Not only is the basic computer quite astonishing, but Spectra Video's energetic president, Harry Fox, showed us

Commodore 64 in a compact package.

Spectra Video SV-318 computer.



NEW!
EPSON
QX-10!
UNDE… £3,000!
Personal Computer
System Unit

If you just bought another computer,
boy are you gonna be sorry.

Epson.

The new Epson QX-10 is unlike any personal computer you've ever seen. It's a computer for people who don't have the time to learn computers; a computer you can be using within minutes.

And fortunately, you don't have to take our word for it. Here's how *Byte*, one of the computer industry's most prestigious magazines, describes the QX-10.

The first anybody-can-use-it computer.
"The Epson QX-10 (is) a computer for less than $3000 that may well be the first of a new breed of anybody-can-use-it 'appliance' computers . . . In addition to being a highly integrated word processing/computer system that offers as much usable processing power as almost any existing microcomputer, the QX-10 . . . system is designed to be used by people with minimal technical knowledge. We've certainly heard that claim before, but Epson has delivered on this promise in a way and to an extent that *no* microcomputer manufacturer has done."

That's nice to hear from a magazine like *Byte*, of course, but it doesn't surprise us. It's just what we intended the QX-10 to be all along.

More computer. Less money.
But useability isn't the only thing the QX-10 has going for it. As *Byte* says, "the QX-10 gives you a great deal for your money.

"Help is available at any time through the HASCI (Human Application Standard Computer Interface) keyboard Help key . . . Text can be entered at any time just as you would in a conventional word processor. The Calc key turns the system into a basic 4-function calculator. Graphics can be created via the Draw key. The Sched (schedule) key gives you access to a computer-kept appointment book, a built-in clock/timer/alarm, and an event scheduler."

Advanced hardware for advanced software.
As for hardware, *Popular Computing*, another industry leader, says: "The QX-10 includes . . . a number of advanced hardware features . . . The basic components of the system are a detachable keyboard, a high resolution monochrome display, and a system unit containing two 5¼ inch disk drives. The drives use double-sided, double-density disks (340K bytes per disk) and are amazingly compact . . . The QX-10 uses an 8-bit Z80A microprocessor. The system contains 256 bytes of RAM. Some of the RAM is . . . battery powered . . . which lets the computer retain information when the power is off."

You won't have to wait much longer.
The new Epson QX-10 may very well be the computer you've been waiting for. And fortunately, you won't have to wait much longer — it will be appearing soon in computer stores all across the country. In the meantime, write Epson at 3415 Kashiwa Street, Torrance, CA 90505, or call (213) 539-9140. We'll be happy to send you copies of our reviews.

After all, as *Popular Computing* puts it, the QX-10 will "do for computing what the Model T did for transportation."

And we couldn't have said it better ourselves.

EPSON
EPSON AMERICA, INC.
COMPUTER PRODUCTS DIVISION

3415 Kashiwa Street
Torrance, California 90505
(213) 539-9140

CIRCLE 164 ON READER SERVICE CARD

14 hardware peripherals and a mind-boggling array of software all supposedly ready for immediate delivery.

The modestly-priced hardware peripherals include an expansion interface, dual-channel cassette recorder, floppy disk drive, memory expanders, interfaces, dot matrix printer, modem, and a nifty touch sensitive graphics tablet. Also available is an adapter to allow playing ColecoVision games on the computer ($70).

Another step up in price is the **Panasonic** JR-200, a computer we previously saw as a prototype but that is now ready for delivery. (In fact, we have one and will be reporting on it fully in the near future.) The JR-200 has 32K of RAM, 16K of ROM with extended Basic, and built-in cassette, Centronics parallel printer, and Atari-type joystick interfaces. It produces both a composite video signal for a TV or monitor and an RGB color signal. The cassette interface runs at 2400 baud—the fastest we've seen on a small computer.

Panasonic JR-200 computer.

Surprisingly, the graphics resolution is relatively low (64 x 48 pixels) but with the built-in 64-character graphics set, the effects are excellent. The JR-200 can generate sounds over a five-octave range on three channels.

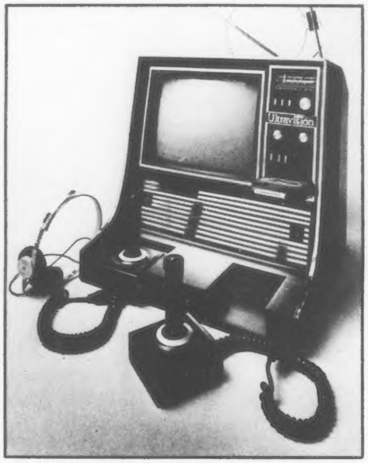
Also announced were a cassette recorder, 80-column dot matrix printer, RGB monitor, RS-232 interface, and acoustic modem (hey, haven't you guys heard about direct connect modems?).

As expected, **Atari** introduced the 1200XL home computer at the decidedly uncompetitive price of $899. Compatible with the 400 and 800, the 1200XL has 64K of RAM, 12 user-programmable function keys, a self-diagnose function, 256 colors(!), and a four-voice music synthesizer with a range of 3-½ octaves.

Atari 1200XL computer.

Atari also announced several new peripherals including a two-channel cassette recorder, an 80-column printer, and a 40-column four-color printer/plotter ($299).

A wide range of new software packages was announced; reviews will appear in upcoming issues.



Ultravision is a combination TV, game system and computer.

Ultravision, a new company, introduced an all-in-one video game, color television, and personal computer system. It is a one-piece console with a 10" color TV, video game system for Atari VCS games, and a personal computer. The Z80-based computer has 64K of RAM and is said to be software compatible with the Apple at both the Basic and machine language levels. We don't see how, since the Apple uses a 6502 chip. Accordingly, we give Ultravision our

We'll Believe It When We See It Award

Nevertheless, even if the system does only one half of what is claimed for it, it will be quite impressive. It uses special 16-position joysticks for playing both VCS and Ultravision games. It has built-in sound effects and simulated stereo. And in the computer area, it has 64K RAM, 12K ROM, 16 colors, and every kind of interface in the book. Projected price is $995.

Epson, on the other hand, is likely to deliver what they announce. They were showing the HX-20 (complete review in the March issue) and the new QX-10. The big difference between the QX-10 and other computers is that it immediately comes up in Valdocs (short for Valuable Documents), an easy-to-use software package that includes word processing, information storage, a calculator, message center, and graph drawing routine. The system can also call up any CP/M program from disk.

Epson QX-10 is exceptionally user friendly.

The QX-10 has a world of interesting features such as a key that gives the user the option of printing in three different sizes and typefaces. In fact, we think it deserves the

Most User-Friendly Computer Award

We used the computer for an hour or so and found it to be one of the most user-friendly (an overused term) units available. Price is "under $3000." We'll have a complete review just as soon as we get one.

Another business-oriented unit being shown was the $2000 **Sanyo** MBC 1000. It has loads of features (CP/M, built-in business graphics, an excellent data storage and retrieval system, every imaginable interface, and so on). We'll be reviewing it in an upcoming issue.

Once again **Toshiba** showed their T100 machine. Like the Sanyo, it uses CP/M, has 64K of RAM, and all kinds of goodies. We've been singularly unsuccessful in getting one of these for review in the past, but we'll try again.

Another business-oriented computer being shown was the Pied Piper by **STM Electronics.** This is a beautifully styled portable unit selling for a bargain $1299. Like most other business units, it has 64K, runs CP/M and includes a wide range of software.

Yet another business unit (what are all these people doing at CES?) being shown was the M20 from **Olivetti.** They were inviting comparison between their $3000 unit and the Apple III, IBM PC, and Xerox 820. With 128K of RAM, 320K on a 5" disk and a 16-bit mpu, the M20 looks good.

Printers and Peripherals

While CES is hardly the place to look for new computer printers and

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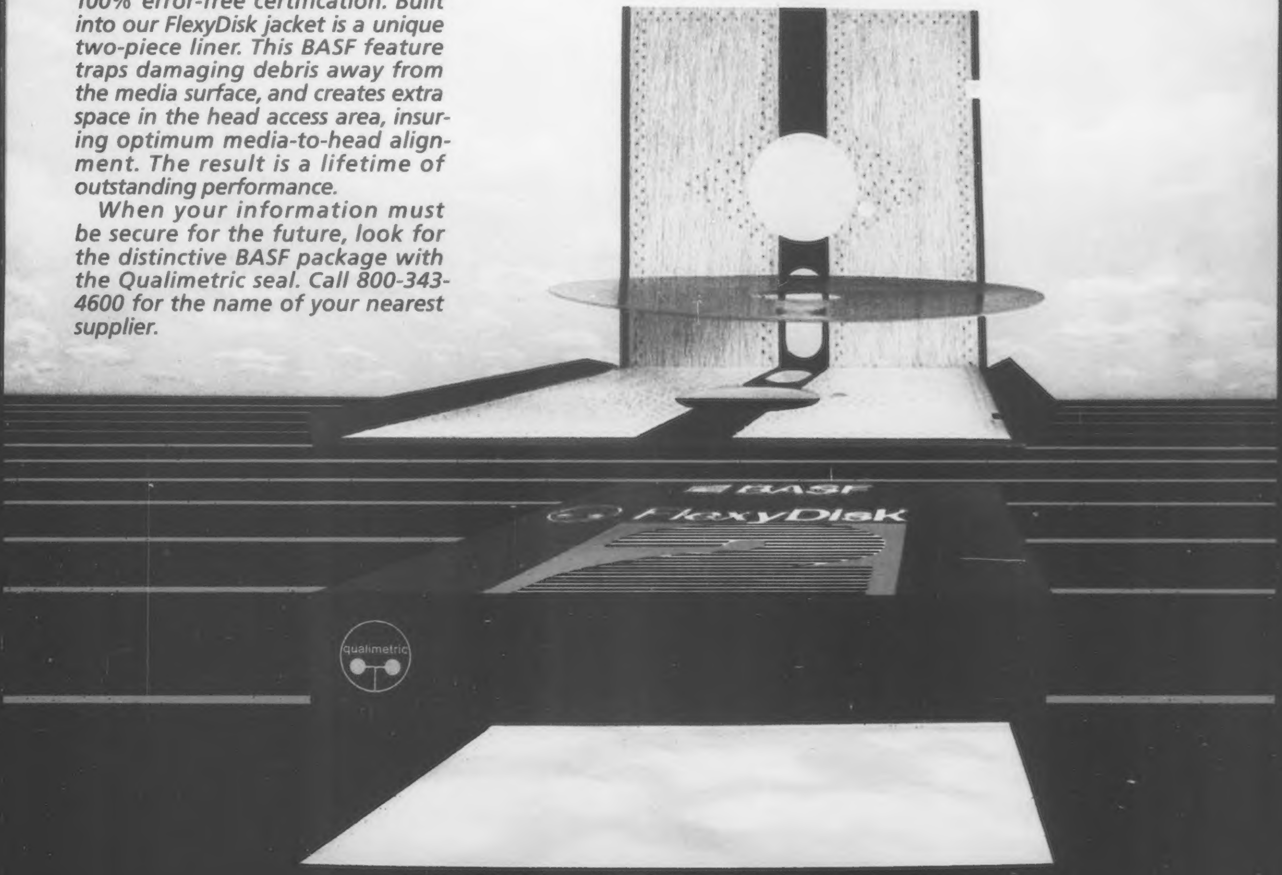

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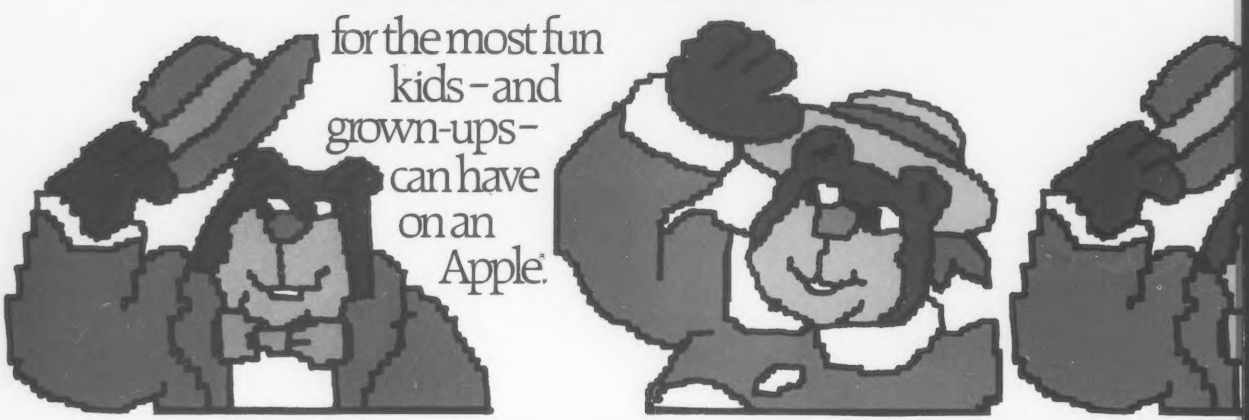
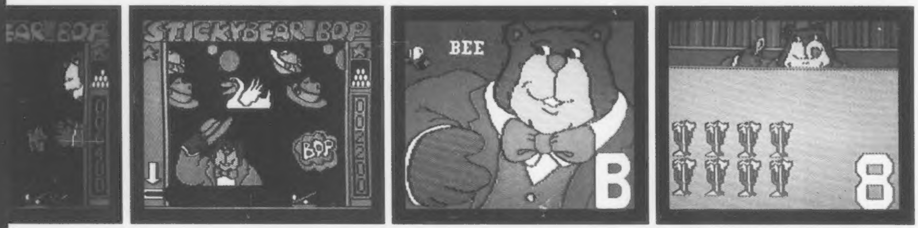


Is Stickybear™ just for kids? Or can grown-ups have a barrelful of fun, too, with the first animated character created exclusively for the Apple® personal computer?

The answer is crystal clear when the whole family sits down to play Stickybear Bop, the action game with better than arcade-quality graphics that the three-year-olds can enjoy with grown-ups.



It's so simple even little kids can rack up big scores at the Stickybear Bop shooting galleries. And so exciting, the grown-ups will join right in on the thrills!

And Stickybear Bop is a complete program. Besides the disk, there's a full-size color poster, a bright, durable vinyl binder, a special stand-up game, Stickybear stickers and instructions. All for only $39.95!

Stickybear makes learning a joy!

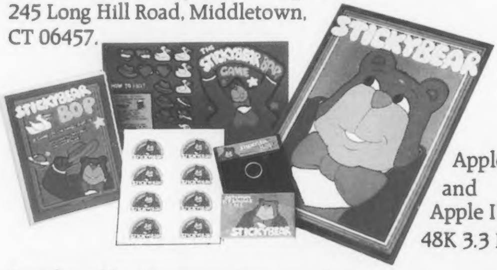
Besides Stickybear Bop, there are two special programs to help three- to six-year-olds build important school skills.

Stickybear ABC helps kids learn the alphabet …and Stickybear Numbers helps them learn to add and subtract. And they do it with animated objects that move over color backgrounds without the need for special hardware.

Both ABC and Numbers include the program disk, a 32-page hardcover book by noted children's author Richard Hefter, Stickybear stickers, a wipe-clean vinyl binder and a special full-color poster. Just $39.95 each!

Look for the Stickybear programs in finer computer stores everywhere. Dealers are invited to inquire by calling toll-free 1-800-852-5000.

If there is no store near you, Visa and MasterCard holders may order by calling toll-free 1-800-852-5000. Or, send a check or money order for $39.95 for each program, plus $2.00 per program for shipping and handling (please add state sales tax) to Xerox Education Publications/Weekly Reader, Dept. 33-A, 245 Long Hill Road, Middletown, CT 06457.



Apple II
and
Apple II Plus
48K 3.3 DOS

Developed by Optimum Resource, Inc.
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AA/MS7-CC

CIRCLE 304 ON READER SERVICE CARD

peripherals, at least one printer looked very interesting. That was the HR-15 daisywheel printer from **Brother.** Speed is an agonizingly slow 13 cps, but the printer is able to do subscripts and superscripts, do underlines and strikeouts, print in red and black, and operate with the Diablo 630 protocol. All this at a bargain-basement price of $595 for an RO (receive only) version and about $750 for one with a keyboard.

TeleData announced three modems, one to simply receive messages and print them out (no computer needed), a basic modem, and a "smart" modem with auto answer, auto dial, and all the other expected features. The best thing was the price—about $60 for the first unit and $150 or so for the smart one.

We mentioned earlier that the sales of audio and video products were on the decline. This is bad news for the audio/video furniture and accessory manufacturers too, so most of them have turned to the computer industry in some way. Some have leaped in with both feet; others are testing the water with an item or two. We saw several head cleaning kits from people previously in the record care business, and so on.

American Innovations, a new manufacturer, showed a basic line of furniture including a computer stand, monitor stand, and two printer stands. The price is right—$79.95 for the computer stand and $49.95 for the printer stand. But better than the price was the thoughtful detailing such as an inset continuous molding strip around the top (no sharp corners, no pealing molding). Also, a system of grooves makes assembly a snap—literally—no screws are used at all. As a result, we give American Innovations the

Simple Assembly Award

This was quite an unbelievable CES, but the products mentioned here are probably just a hint of the products about to hit the store shelves this year. You'll notice that we did not get into computer software at all. That is not because none was introduced—an enormous amount was. However, we prefer to review computer software rather than just report on new releases and, furthermore, we just don't have the room in this issue. Maybe next month.

We would, however, like to make two awards to computer software manufacturers. The first is the

Grossest Game Name Award

This goes to Synapse for *Slime,* a new Atari game. Actually, Synapse has some of the best Atari computer games around, including *Shamus, Chicken, Nautilus,* and *Claim Jumper. Slime* is probably a great game too, but the name . . . .

The other award is the

Most Licensed Characters Without A Product Award

This goes to Datasoft for licensing the characters from the Dallas TV series; Banjo, the woodpile cat; Heathcliff, "America's top cat" (wonder what Garfield thinks of that!); and no fewer than 200 Terrytoons characters including Heckle and Jeckle, Deputy Dog, and Pearl Pureheart. We like the Datasoft Atari computer games (*Canyon Climber, Tumble Bugs, Clowns & Balloons,* etc.) but we think they'll be hard pressed to come up with wonderful new games for all these characters.

Another award we had was the

Most Unplayable Game Award

Since there were so many companies vying for this one with one or more games, we decided that someone was sure to get all bent out of shape if we awarded it to a competitor. So we decided to let this one go until the next CES. Another award that we should have presented months ago is the

Next Time, Stay Home Award

This goes to the gang from Craig Corporation, a manufacturer of auto sound equipment, who boisterously took their drunken carryings on to Garcia's Mexican restaurant two nights in a row, thus making it extremely unpleasant for other paying patrons. So, if you're looking for autosound equipment, and want intelligent, well mannered employees to help you with the decision, try Kraco or Sparkomatic or Panasonic or anyone but Craig.

Our last award is the

Magazine in Most Demand But Shortest Supply Award

This clearly goes to *Video & Arcade Games,* our newest publication. We had only 100 copies at the show and could have sold 2000, even though everyone else was giving their magazines away free. If you've seen a copy, you know why—it's the first literate magazine in an admittedly crowded field of arcade, video and electronic games magazines. If you haven't seen a copy, pick one up at your local newsstand—if there are any left.

We hope you have enjoyed our coverage of CES. We've covered this show several different ways in the past; what do you think of this approach? Let us hear from you.

The Perfect Press Conference

The life of a journalist is glamourous and exciting. We find out about and get to use wonderful new products months before they are available to the public.

The medium through which most of these products—from game cartridges to minicomputers—are introduced is the press conference and its close cousin, the press reception.

Now press conferences and receptions come in a myriad of forms—long, short, entertaining, boring, luncheons, dinners, cocktail parties, wine and cheese—but they all have a common objective: to obtain media coverage for a product, person, or organization.

Some companies achieve this objective better than others, and having just returned from a non-stop round of press conferences and receptions at the Consumer Electronics Show in Las Vegas, we thought we would take a little space to put forth our observations and opinions on what makes a good press conference.

Our observations are, of course, aimed primarily at the public relations agencies and departments of the companies in the consumer electronics industry, but we hope that the rest of you will find them informative and entertaining as well.

Rule Number One:
Choose a Convenient Location.

Obviously, the best coverage of a new product will come from the people who attend the introduction—those who have had an opportunity to play the game, type on the word processor, talk to the designer. So, the first step in planning a press conference is to figure out how to get the people you want to attend.

Perhaps the most important factor in determining whether a person shows up at your affair is location. The closer it is to wherever the attendees will be coming from, the better. For this reason, it is probably worth paying the exhorbitant rental and catering charges of the headquarters hotel to ensure that people will be able to find your reception.

A case in point: we received an invitation to a breakfast at which an apparently exciting product was to be introduced at CES. The motel in which it was to be held was one of which we had never heard. It was not on the maps distributed by the show management, and the invitation said only that it was "near the Convention Center."

We didn't know where the motel was, and an hour before the opening of the show didn't have time to hunt for it, so we didn't go. We finally did get to see the product one evening after the show, but although the motel was only a few blocks from the Convention Center, we drove around Las Vegas for half an hour before we found it.

Rule Number Two: Choose a Convenient Time.

After you have chosen a good, accessible location for the event, you must choose a time. At a show, dozens of manufacturers compete for the writer's time in the evening, so forget that. Midmorning and mid-afternoon hours should also be shunned because people tend to get involved on the show floor and either forget or don't want to take the time to go to a press conference. Most people, however, eat breakfast, and almost everyone breaks for lunch.

So, early in the morning, before the show starts, and around noon are good times to schedule a press event. Which brings us to the subject of food and Rule Number Three.

Rule Number Three: Feed Them.

One of the very best ways to get the attention of journalists is to offer them food. Freelance writers and staffers from small publications on limited budgets sometimes depend on the fare at press functions for their sustenance at shows. And although that is, from the manufacturer's point of view, not a reason to serve food at a press conference, it does get people—at least some of them the ones you want—to attend.

What kind of food should you serve? Well, we won't go into menu planning here any more than to say that it need not be elaborate as long as it tastes good and there is plenty of it.

Several years ago, *Infoworld* gave a party at the West Coast Computer Faire for members of the press and industry friends. Shortly after the announced starting time, an assortment of hot and cold hors d'oeuvres was placed on a long table in the middle of the room. Guests descended like locusts on the feast, and in a matter of minutes, the serving trays were bare. Everyone stood around waiting for refills to appear. None ever did. In fact, in what seemed like record time, the table was cleared, folded up, and removed. It was an event that will be long remembered—for the wrong reasons.

Rule Number Four: Choose Your Spokesperson Carefully.

Most press functions include some sort of formal presentation during which writers and editors are asked to suspend their repast long enough to listen to the official introduction of the product.

Frequently, this announcement is made by the president of the company or the designer of the product. Almost as frequently, this is a disaster, because executives and engineers are not necessarily good speakers. They walk to the podium, thank you for coming, and proceed to read a speech prepared for them by a PR agency. Much more often than not, this speech tells the guests nothing they could not read in the press kits sitting in their laps.

The job of the person making the formal presentation should be to communicate enough of his own enthusiasm for the product to make the members of the press examine the press kit for details. Reciting specifications and marketing strategies leads only to frustration and boredom.

It is certainly a good idea to have the president or designer present to answer individual questions for those who have them, but unless he is an accomplished speaker, keep him away from the microphone. And under all circumstances, keep the presentation brief.

Rule Number Five: Have the Product Available

The person who comes to a press conference to get a story looks for an angle or personal observation that will make his story different from everyone else's. Having the product in the room and running—even if only in prototype form—provides an opportunity to create that difference.

Having the product available also lends credibility to the announcement. It shows that the manufacturer is at least within striking distance of a production model. A press conference announcing a product that will exist someday, somehow lacks substance, and the person who writes optimistically about it is almost as susceptible to ridicule as the manufacturer if the product never materializes.

Rule Number Six: Have People Available to Demonstrate the Product.

If it is important to let your guests experiment with the product, it is equally important to have an informed member of your organization available to answer questions and get people started using the product.

For example, if your product is a game, it is foolish to leave the controls completely unattended so that would-be players who have no idea how to play are wiped out within seconds and soon give up in disgust. Better to have an employee nearby to explain the rules and give a short demonstration. Employees should be cautioned not to monopolize the controls or let other guests monopolize them.

So there you have it—the perfect press conference in a nutshell. Unfortunately, none of the functions we attended a CES met all our requirements, but we'll keep our eyes, ears, and mouths open at NCC and summer CES, and who knows, maybe there will be a Perfect Press Conference Award in our report from those shows.

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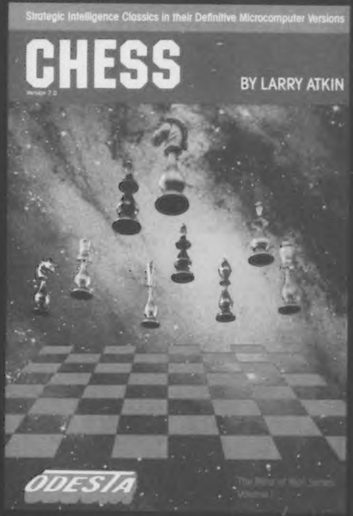
Authors of the Northwestern University 4.7 Computer Chess program. Winners of the World Computer Chess Tournament 1977-1980. Winners of 8 North American Computer Chess Championships between 1970 and 1979. Two of the world's authorities on machine intelligence.

PETER FREY

Professor at Northwestern University, teaching courses in Psychology and Computer Science. Editor of and contributor to the definitive text on computer chess, **Chess Skill in Man and Machine.** One of the U.S. Othello Association's top-ranked players.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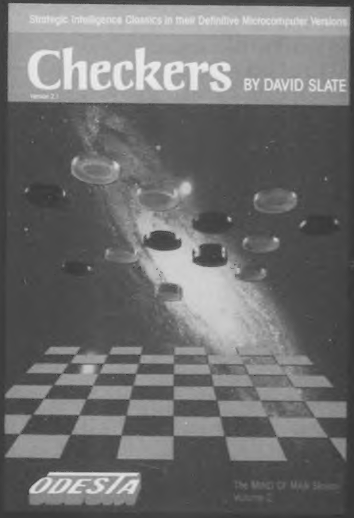
Strategic Intelligence Classics in their Definitive Microcomputer Versions
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CES: Another Perspective

Ken Uston

My reaction to the Consumer Electronics Show in Las Vegas can be summed up in one phrase, with apologies to the Val Gals: "Totally awesome—To The Max."

I spent four full days wandering from exhibit to exhibit, talking to manufacturers, playing dozens of new video games, and experimenting with other software. Then I took three more days to read the three-foot stack of literature accumulated during the show.

My basic conclusion: the dominant implication of 1983 WCES is that the line of demarcation between video game systems and home computers is vanishing. I predict that, by the end of 1983, the functions performed by most game systems and home computers will be identical.

Video Systems Are Being Converted To Home Computers

Four companies announced modules that will convert the King of Home Video Systems, the Atari VCS, into a real, live, honest-to-goodness computer. These units are made by SpectraVideo, Entex, Unitronics and Emerson. Most have a keyboard, 2K or 3K of RAM, and built-in Basic.

Mattel finally replaced their antediluvian Intellivision with a compact, sleek game system called Intellivision II. They displayed a "Computer Adaptor" and keyboard which converts Intellivision II into a 2K RAM computer, with 16-bit microprocessor and built-in Basic. The keyboard is attractive and full sized with 49 keys. (Remember, though, that Mattel has been announcing computer modules for years and has yet actually to deliver them in quantity.)

Brøderbund

On behalf of Video & Arcade Games, *Betsy Staples (L) presented a Gamester of the Year certificate to Cathy Carlston of Broderbund Software in honor of Sea-Fox being selected for use in the competition.*

Mattel plans to produce games, educational, programming and music cartridges for the Intellivision II, which is also compatible with existing Intellivision cartridges. In a move which could really hurt the Atari VCS, they showed a module which allows play of Atari VCS games on the Intellivision system.

Mattel also displayed a powerful new game system, called Intellivision III. This product was so secret that many Mattel employees first found out about it at CES. It was displayed in a private room, by invitation only. Thanks to a friend at Mattel, I managed to see it. It's fabulous. It includes 320 x 192 pixel screen resolution, a "nearly infinite" selection of colors, up to 64 moving objects, and built-in stereo sound effects. A remote control joystick replaces the infamous Mattel disk. Intellivision III will be convertible into a home computer with the Computer Adaptor and keyboard.

On display at the Odyssey booth was a "Command Center," with full size keyboard and a modem, which allows the Odyssey game system to function as a dumb terminal, linkable to information services as The Source and Compuserve.

Company reps for both Atari and Coleco stated that they had plans to produce modules to convert the Atari 5200 and ColecoVision into home computers, although no equipment was on display.

Home Computers Are Being Converted To Video Systems

Cardco announced a module that lets the Vic 20 play Atari VCS games.

When Coleco came out with a VCS module for their ColecoVision, they were slapped with a patent infringement lawsuit by Atari. (They counter-sued, filing a restraint of trade complaint.) Wary of legal entanglements, Cardco secretly displayed their product in the bedroom of a Vegas motel. They claimed it would be available during the last week of January and list for $90.

SpectraVideo did to Coleco what Coleco did to Atari. They announced a $299 home computer, the SV-318, with a unit that allows all the ColecoVision games to be played on the SV-318. (I wonder if Coleco will sue them for patent infringement.)

Ken Uston.

More And More Companies Are Producing Both Video Systems And Home Computer Games

In a further erosion of the line between home systems and home computers, several companies have announced plans to produce game software for both types of systems. Imagic plans to make games for the Atari VCS, Intellivision, Odyssey, Vic 20 and Atari computers. Activision announced plans to provide games for the Atari computers. When I asked president Jim Levy whether Activision might produce Vic 20 or TI 99/4A games, he said the company is "studying" that possibility.

The Vic 20 and TI 99/4A computers sold heavily in late 1982. This has not escaped the attention of software houses, and more and more companies are producing games for these two computers, including Thorne EMI Video and Human Engineered Software (HES). The net result, of course, will be that these computers will become even more viable game-playing systems.

The result of all of this is good news to the consumer. We'll have a wide range of home systems that:

- will play a wide variety of new, better games.
- will include a complete line of educational, home finance, music, art and other software.
- will be fully programmable, to the delight of computer hackers.

A Couple Of Gripes

Now don't get me wrong. I had the time of my life at WCES. I hope never to miss a CES for the rest of my life—God

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8″ SSSD Shugart Compatible, 32 Hard Sector	F31A	1.99
8″ SSDD IBM Compatible (128 B/S, 26 Sectors)	F131	2.49
8″ DSDD Soft Sector (Unformatted)	F14A	3.19
8″ DSDD Soft Sector (256 B/S, 26 Sectors)	F144	3.19
8″ DSDD Soft Sector (512 B/S, 15 Sectors)	F145	3.19
8″ DSDD Soft Sector (1024 B/S, 8 Sectors)	F147	3.19
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SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.

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CIRCLE 138 ON READER SERVICE CARD

CES, continued...

willing and the creek don't rise. But why on earth don't the companies train their people to use the products they're demonstrating? Some horror stories:

I went to the TI booth to review a music program for the 99/4A. I put the cartridge in, but couldn't get it to work properly. I asked a company representative standing nearby for help. He said, "Well, my daughter can run it, but I don't know much about it." (His daughter couldn't help; she was in L.A.) After 10 minutes or so, I collared another TI rep and asked for help. She said, "I'm sorry. The person who demonstrates this is on break."

I found a third person with a TI badge. She said, "I've picked up a cold and have to leave the floor." (The Southern California flu had a field day circulating among the 70,000+ people at CES—it got hundreds of us, including my girlfriend and me).

I spent two hours experimenting with the cartridge before I fully understood how it worked. (It's pretty good.)

Then I tried to play a 99/4A Scott Adams adventure. I went through three more company representatives before I found someone who could load the program for me. The game requires both a cartridge and a floppy disk; two out of the three didn't even know that.

Then it was off to Mattel. They were demonstrating their new Aquarius computer in a separate section. Three of the computers were supposed to be hooked up to CompuServe, the information service. I tried to operate one to no avail and finally asked for help. The first fellow said, "I only show the word processing package." The second, to her credit, tried, but couldn't raise CompuServe (I later found out it was because she forgot to dial the number). A third finally managed to get things started, but we got a busy signal.

The gal told me, "They're probably real busy because of the show. We might not be able to get through for a half hour or so." I sensed that she just wanted me to go away. I did.

As I left, I first wondered whether this meant that users might as well forget trying to use CompuServe during the eight days each year that CES is running. Then I wondered how 30 or so CES hookups out of a customer base of over 30,000 could cause a logjam in the system.

I went to see a couple of new Sony computers. When I first asked for literature, the rep said, "We've barely got the equipment together in time for the show, let alone having time to print anything up."

O.K. Fair enough. I asked "What compatible software will be available?" The rep had no idea. After a few more questions I just left, convinced from the rep's evasiveness and vagueness, that the computers might never see the market.

At a press conference held by Ultravision, the company president announced that his system would be sold for $999. All the press handouts said $595. Incredibly, the president made no mention of the discrepency in his speech. David Ahl finally asked him about it (answer: the keyboard, not shown in the press package, will be included, and the whole package will cost $999).

During his speech, the president said the unit would be expandable to 128K. Afterwards, I asked how that would be possible with an 8-bit microprocessor. He gave me a funny look and remained silent. I said, "Are you going to get around that by using bank switching?"

He nodded affirmatively, but somehow I felt he did it just to duck the question.

In some instances I was given tours by knowledgeable company spokesmen. The best took place at the Spectravision and Data Age booths. But in far more cases, the company reps didn't seem to have enough knowledge about their products to be able to explain it to others. Especially annoying was the way they guessed at the answers. I was supplied answers I knew were wrong at least a dozen times. Picture the poor retailer, making buying decisions based on that information!

One final gripe. Here we are in the center of the technological revolution of the world. Now, just take a guess as to what equipment I'm using in the press room to type this piece. No, it's not a word processor. No, not even an electric typewriter. I'm using a manual Remington Rand! I haven't tried working one of these confounded gadgets since high school typing class.

Now I'm not suggesting that CES should put a word processing system in their press room—I know they're expensive. But what if some company donated one? Can you imagine the gratitude that would result—from reporters from *The New York Times, Newsweek,* and countless newspapers, magazines and other publications? Maybe even more than gratitude —hundreds of thousands of dollars of favorable publicity. Here's hoping somone shows this article to Steve Jobs (yeah, I know Apple doesn't show at CES—but so what?)

Musical Note

I know this is a little off-the-wall for a computer magazine, but I've got to inform you about the most revolutionary musical instrument invention since the electric piano, in my opinion.

An electronic trumpet was demonstrated at WCES that sounds *exactly* like a trumpet. It can be played with no "embrochure"; in other words, you just blow into it. If you've ever tried playing trumpet, you know that you must make your lips vibrate to make sound. To play high notes, you must compress your lips really tightly. Only a handful of players can play "screech" notes, the high screaming sounds that made Maynard Ferguson famous.

Steiner Electronic Valve Instrument.

The instrument, called the Electronic Valve Instrument (EVI), was invented by Nyle Steiner. It allows you to play as high or low as you want, simply by blowing into the instrument and turning a canister with your left hand to select one of seven octaves.

I heard Nyle play the EVI at the show accompanied by a keyboard player. I couldn't believe the results. EVI can produce the rich broad tones of Harry James or the narrow shrill lines of Dizzy Gillespie. Until now, this could be accomplished only by subtle, artful changes in embrochure. At first, I thought that EVI had obsoleted all trumpet players. Upon reflection, however, I realized that some players, such as Dizzy, have so much "soul" in their improvisational lines that most of us couldn't come close to duplicating it. But wait. I predict there will soon be a device to pre-record lines into EVI, just as Casio keyboards can now "read" and play music, as shown in the attached photograph.

I sheepishly asked the two questions you're probably wondering about: when is EVI available and how much will it cost? I braced myself for a multi-thousand dollar response. I nearly fell off my chair when told that the EVI is in stores now and lists for $350!

Gladys Knight "playing" the Casio MT-70.

". . . faithfully captures the look, spirit and play of arcade 'Space Invaders'".

-John Anderson,
Creative Computing

"All are excellent versions of the arcade games with super graphics and sound."

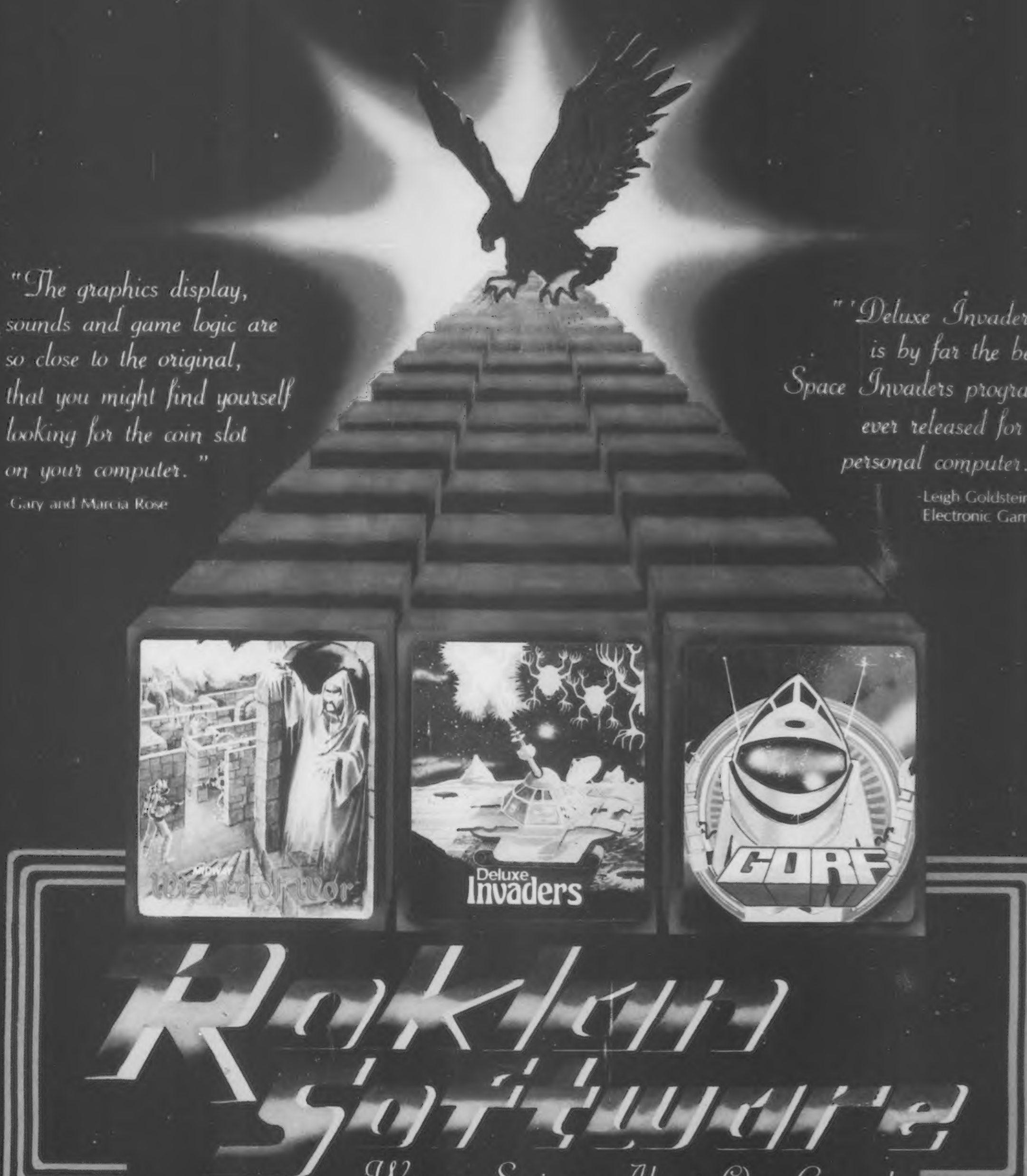
-Mark Benioff
A.N.A.L.O.G.

"The graphics display, sounds and game logic are so close to the original, that you might find yourself looking for the coin slot on your computer."

Gary and Marcia Rose

"'Deluxe Invaders' is by far the best Space Invaders program ever released for a personal computer."

-Leigh Goldstein,
Electronic Games


Midway
Wizard of Wor
Deluxe Invaders
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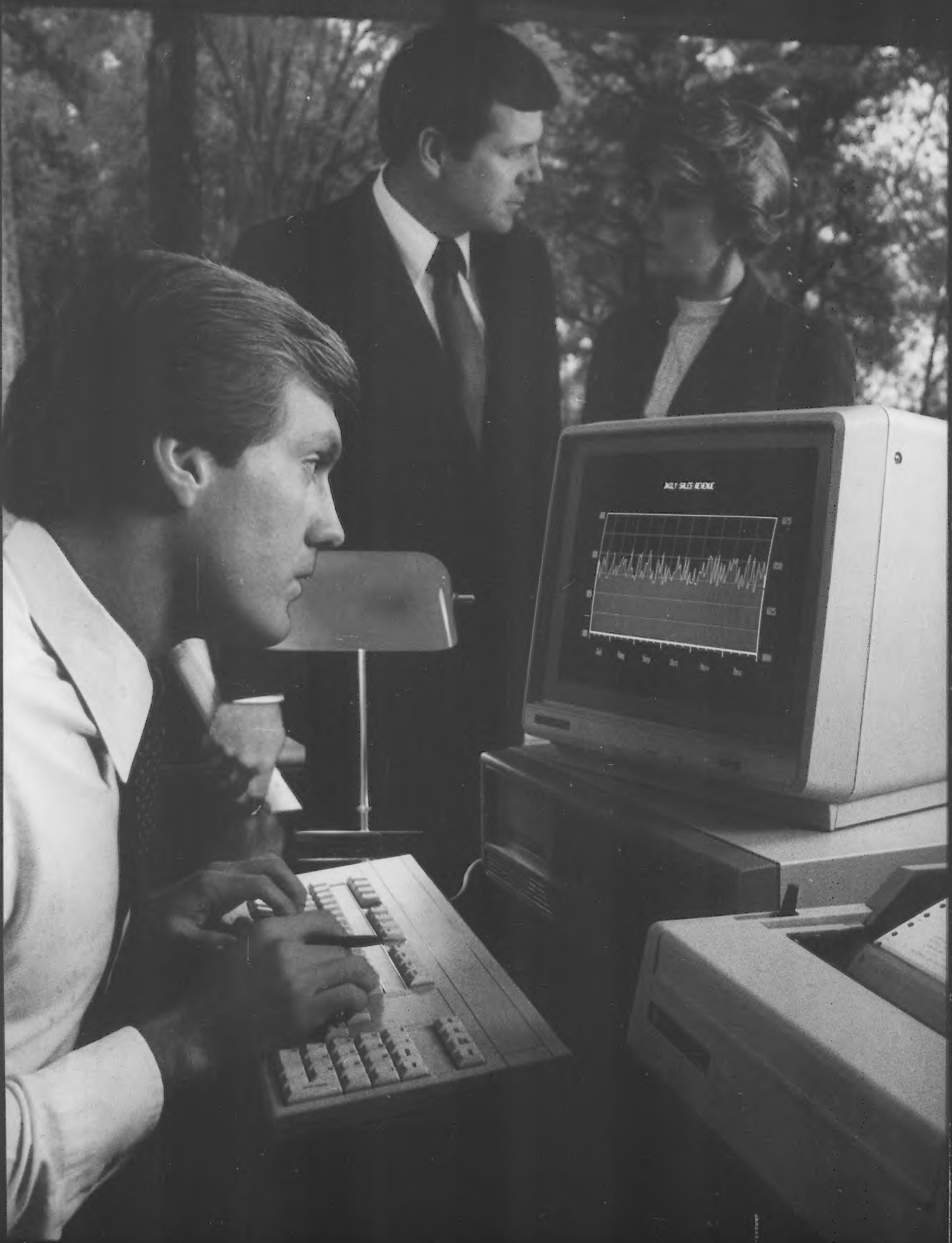
CIRCLE 257 ON READER SERVICE CARD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SPECIFICATIONS

System Unit
16-bit, 8088 microprocessor
64K byte RAM, expandable to 256K bytes
4K byte graphics display memory
5-slot expansion bus

Keyboard
Specially designed low profile
Popular typewriter layout
97 keys, including 12 function keys
Separate numeric keypad and cursor control clusters
Tactile response, for quick positive entry
Upper- and lower-case letters

Display Units
12-inch monochrome (green phosphor) or 13-inch full-color, 25 lines x 80 columns
High resolution, 720 x 300 pixels

Mass Storage
Built-in 320K byte diskette standard
Additional internal storage of 320K byte diskette, or 5 or 10 Mbyte Winchester disks optional

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3270 SNA stand-alone (Summer 1983)
3270 BSC and SNA cluster (Fall 1983)

Operating Systems
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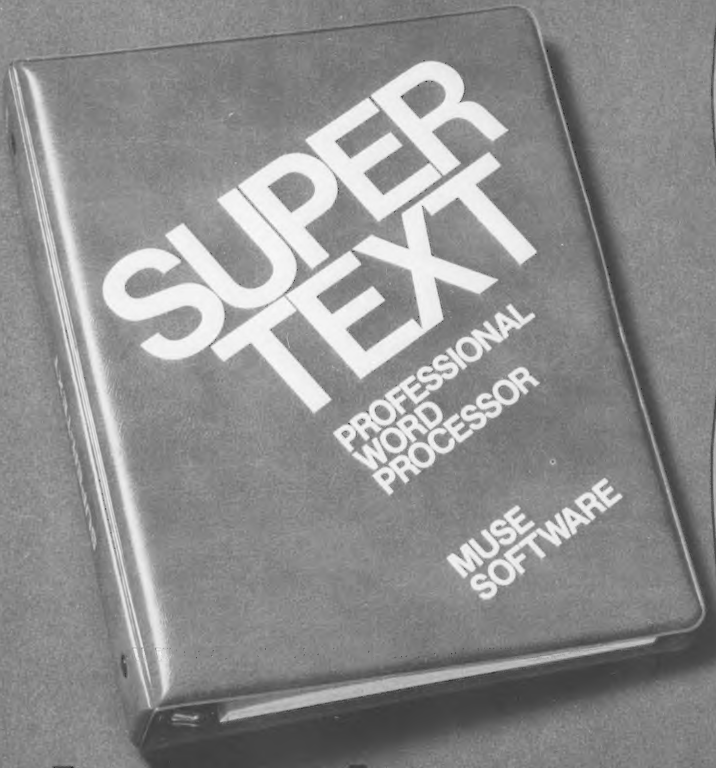

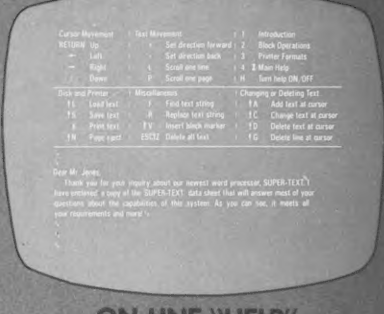

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Cursor Movement  ! Text Movement              ! 1    Introduction
RETURN  Up       !    +   Set direction forward ! 2    Block Operations
  ←     Left     !    -   Set direction back   ! 3    Printer Formats
  →     Right    !    L   Scroll one line      ! 4 ‡ Main Help
  /     Down     !    P   Scroll one page      ! H    Turn help ON/OFF
Disk and Printer ! Miscellaneous               ! Changing or Deleting Text
  ↑L    Load text !   F   Find text string     !  ↑A   Add text at cursor
  ↑S    Save text !   R   Replace text string  !  ↑C   Change text at cursor
  #     Print text !  ↑V  Insert block marker  !  ↑D   Delete text at cursor
  ↑N    Page eject ! ESCTZ Delete all text     !  ↑G   Delete line at cursor

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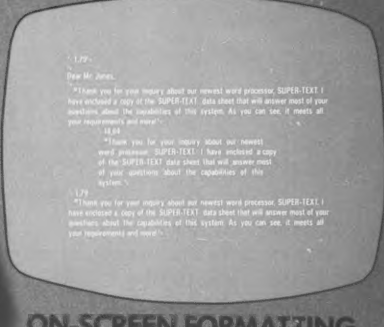

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questions about the capabilities of this system. As you can see, it meets all
your requirements and more!
          14,64
           *Thank you for your inquiry about our newest
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          of the SUPER-TEXT data sheet that will answer most
          of your questions about the capabilities of this
          system.
 <1.79
  *Thank you for your inquiry about our newest word processor, SUPER-TEXT. I
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The SyQuest 306

Will Fastie

The pace of technological development in the computer industry is too rapid for the human eye to see, much less for the human mind to comprehend. Just as we think we have mastered something, its replacement is announced, or we discover that it has been made obsolete by an entirely new development. For the most part, however, these things are not particularly revolutionary. They have an effect, but most don't change the face of the industry.

That is why I was so excited to find myself with a few extra hours before my plane left San Jose several months ago, and why I was overjoyed when Syed Iftikar, chairman and president of SyQuest Technology, agreed to meet with me. I made a mad dash for Fremont and with little trouble found the brand new, 65,000 square foot headquarters of this less than one-year-old company.

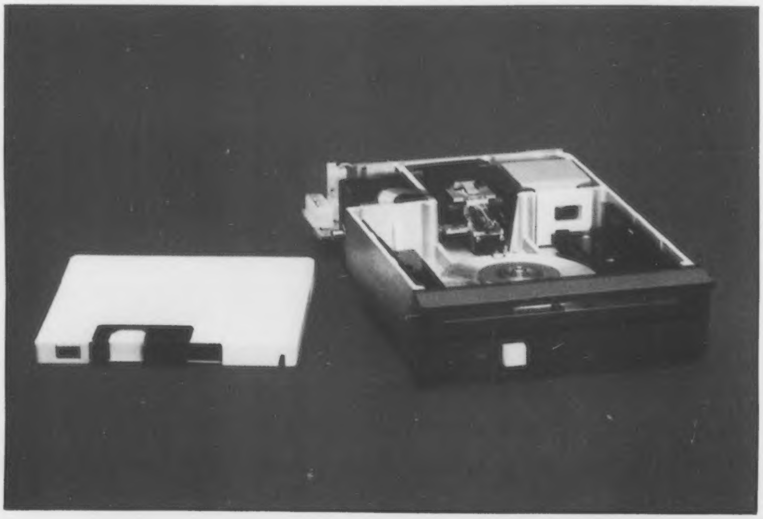
What has me so excited is a new disk drive Mr. Iftikar and his company are manufacturing. It is a 5Mb, removable media Winchester disk drive with some characteristics that I think will cause quite a revolution in the small systems market, especially if Mr. Iftikar is able to achieve what I think are some pretty ambitious goals, but about which he is confident.

Here are the significant attributes of the drive. First, of course, it uses removable media. A cartridge drive can be an excellent alternative for backup, especially because it can be used as direct storage. It can also stand alone as primary mass storage. Second, the SyQuest 306 is half the size of the industry standard (5¼") mini-floppy. It is the height that has been halved, so two SQ306s will fit in the same space occupied by a single mini-floppy drive. Third, it consumes about the same amount of power as a mini-floppy. This important factor means that it can directly replace a floppy in a system without requiring changes to the power supply. Even though it consumes less power, it has an average access time of 75 milliseconds and a data transfer rate of 5 megabits per second, giving it much better performance than floppies. Last, and most important, the price is aggressive.

Pricing

At the moment, the factory price for a single unit is $800. SyQuest is a manufacturer, however, and so does not sell directly to the consumer. They sell to integrators who package the drive with control electronics, software, or whatever else is needed to produce a complete system. The integrator who buys in quantity will pay less than $500 today. Translated into retail terms, this implies an end-user price of under $2000; prices of $1800 for systems using the SQ306 are already a fact.

Considered in a broader context, the price becomes more interesting. Since the drive uses an industry standard ST506 interface, it can be integrated with existing subsystems so that it shares the power supply, enclosure, and controller electronics. Since the integrator will have good margin built in to his subsystem price to begin with, it is possible that the SyQuest drive can be added as a backup device for just a little



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SyQuest 306, continued...

bit more than the integrator's cost. And that also implies that a subsystem consisting of *two* SyQuests can be built rather inexpensively.

That's where I really begin to get excited. Once you own a disk subsystem, cartridge or not, convenient backup is essential. With one SQ306 and even a large main memory, a cartridge-to-cartridge copy is cumbersome. With two cartridges, it is a snap. Not only that, but you have 10Mb online. I think about this the same way I think about floppies, except suddenly the capacity is ten times greater. When I think about reducing my library of floppies to just a few cartridges, my mouth begins to water. I start to get dizzy when I think about not having to change disks every five minutes. At least one company has announced a product with two SQ306 drives for the IBM Personal Computer, and several others are thinking about it.

Bold Claims

Mr. Iftikar, however, is not satisfied with the price. He has set a goal of $150 in large quantities, and intends to achieve the goal with automated assembly and volume manufacturing. He says he will compete with the Japanese, and is quick to point out that he is far ahead of everybody, including Japan, Inc.

Bold claims. And frankly, I was a little skeptical before I visited SyQuest. As I listened to Syed explain his machine and his plans, and as he took me on a tour of his facility, I became more and more impressed. He is a quiet, thoughtful man. His answers to my questions were direct and lucid. There was no false modesty, and no false pride. As he describes how his company moved so rapidly, it becomes obvious that he personally designed the entire drive. He talks about how each engineer had specific, objective goals: make this part thus and so, and make it cost no more than this. He points to his robotics lab, where engineers are building a robot to install the spindle motor of the drive, a robot that will reduce labor costs by 20%. We hover over a table with two drives in operation; the heads and media are completely exposed to the environment, and a sign states "You are encouraged to smoke."

It is more than self-confidence. This is a man who knows what he is doing, and who knows that you know it. This is a man who plays for keeps; he personally financed SyQuest, and remains the sole investor. I walked away from the interview thinking that if Syed Iftikar said it, it would be.

SyQuest knows what they have. They believe that the SQ306 will sell in place of lower capacity hard disks because of the removable media. As the cost drops, and SyQuest expects that to happen fast, a dual-drive cartridge subsystem will compete effectively with mini-floppies. Mr. Iftikar sees SyQuest inserted between floppies and hard disks; he thinks he'll win head-to-head with floppies and will force the Winchesters into higher capacities. He thinks he will undercut flexible or hard disk devices using vertical recording technologies.

Others seem to know what SyQuest has as well. A SyQuest press release at Comdex stated that more than 200 system builders were evaluating the drives. I took an informal poll of vendors of disk subsystems for the IBM PC and found that 90% were already SyQuest customers. At Comdex, about 30 firms exhibited the drive.

Assuming that SyQuest can build all the drives they say they will (200,000 in 1983, with a second source already licensed), and assuming they can produce the cartridges (a SyQuest subsidiary, MicroDisk is in operation, second sources licensed again) in sufficient volume, it certainly sounds as though they have a winner. Look for the unit to pop up everywhere. No matter what kind of computer system you own, I predict availability of this drive for it soon.

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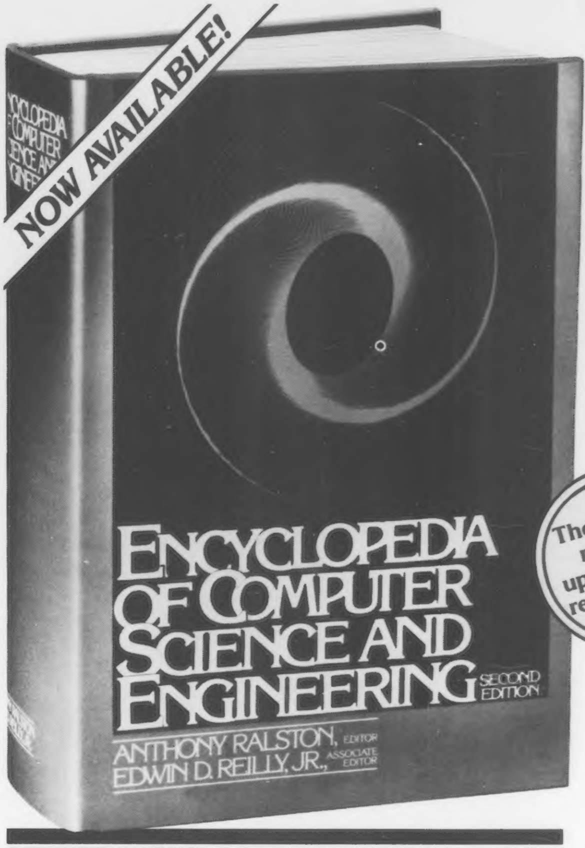
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evaluation

SemiDisk Disk Emulator

Glenn A. Hart

Most computerists are speed freaks. No, that doesn't mean we take drugs, it just indicates that we have an almost unnatural hangup about how fast our machines execute. Witness the continuing popularity of benchmarks that purport to measure how fast some standardized programs will run on a given collection of computer equipment.

Most of the tests don't really provide meaningful information on how a computer will run real world applications, but they are fun anyway. Sometimes the gloating of the "winners" and the rationalizations of the "losers" remind me of children claiming that "my Dad is bigger than your Dad."

This emphasis on speed is doubly odd considering that even a "slow" microcomputer is blindingly fast in human terms. Nevertheless, raw speed is an almost tangible element in the human-machine interaction. Anything that can make a 30-second process take half or a quarter of that brief period seems like a tremendous advance. It makes the machine feel more responsive and much less sluggish.

There are two main avenues to speed enhancement. The clock rate of the central processor is the main determinant of pure processing speed for any given processor chip. A faster clock executes more quickly. Since the clock speed is designed into the system, it cannot readily be changed, so there is not much the average user can accomplish with processor speed.

The main road to higher speed leads to mass storage. I recently wrote an article for *Creative* chronicling my growth from cassette to 5" floppy disk to 8" floppy to Winchester hard disk. Each upgrade resulted in a significant speed increase and made my evolving systems far more pleasant and powerful.

Now there is a "mass storage" device that is a speed freak's dream with speed that exceeds even the hard disks. The SemiDisk is a very high capacity RAM memory board that emulates a disk drive.

The SemiDisk is available in either 512K or 1 meg versions—all on *one* standard S-100 board. New versions are also available for the IBM Personal Computer and the TRS-80 Model II. Such incredible memory density is made possible by the new 64K memory chips (4864s on the SemiDisk). Data are transferred to and from the SemiDisk at the rate of 110K bytes per second. Power consumption is extremely low for the amount of memory involved—typically about 0.6 amp for the 512K board and 0.9 amp for the full megabyte board. Such figures would have been almost unthinkable only a short while ago.

The SemiDisk worked perfectly the very first time!

Installation

Installing the SemiDisk is absolute simplicity. The SemiDisk requires four sequential I/O ports, and any addresses can be selected with a DIP switch. Other switches and jumpers can configure various operating characteristics, but the board is set up at the factory for the most normal configuration. Multiple SemiDisk boards can reside in a system to provide up to an unbelievable eight megabytes. Even with multiple SemiDisks, the same four ports are all that's necessary; on-board switches set up the added boards to simply expand the "disk" capacity of the SemiDisk.

Like most RAM, the SemiDisk cannot store data when power is removed. However, the board includes provisions for battery backup. An 8-12 volt battery, preferably nickel-cadium, is trickle charged by the SemiDisk. Special arrangements are made for power down and power up so data are retained.

SemiDisk Systems claims that the software provided with the board allows the SemiDisk to run with any standard CP/M system. Two main installation paths are possible: the supplied drivers can be built in to the BIOS like any other disk driver if the user knows how to do this, or the SEMIDISK.COM file can be executed. SEMIDISK.COM (for which source code is also provided) allows complete control over the operation of the hardware. Table 1 details the various options available.

The SemiDisk driver is positioned immediately below the normal CP/M Console Command Processor. The Hyper-Boot option speeds execution by preventing the CCP from being reloaded on every warm boot. SEMIDISK.COM can optionally check the hardware configuration and abort if there is an I/O conflict or request the address of the SemiDisk if it is not where the program has been instructed to look. This option is quite useful when first installing the system. Other options control parity

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Glenn A. Hart, 51 Church Road, Monsey, NY 10952.

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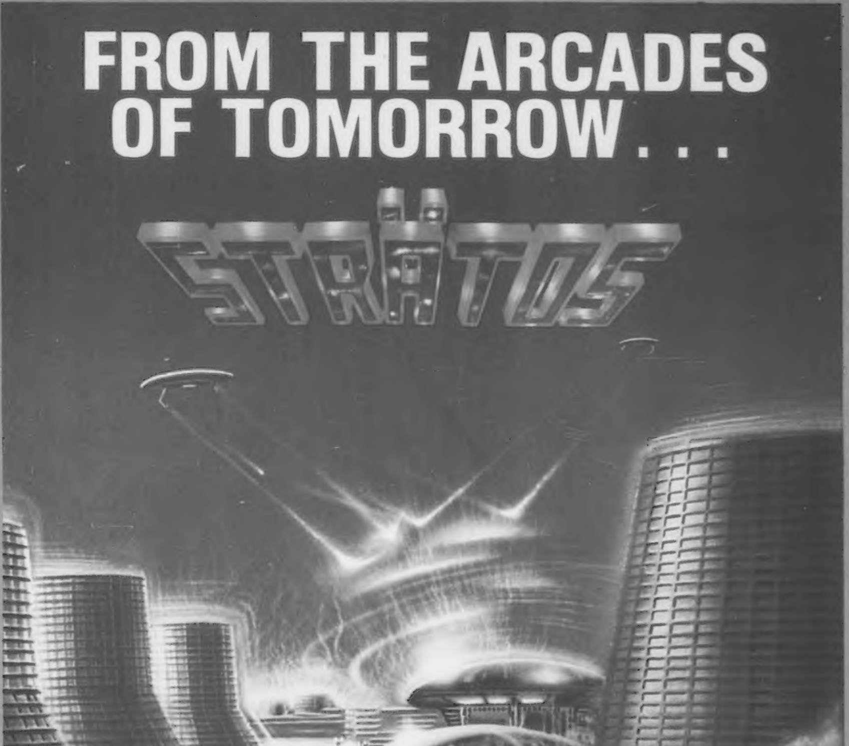

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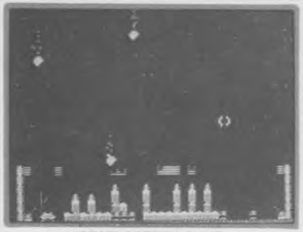

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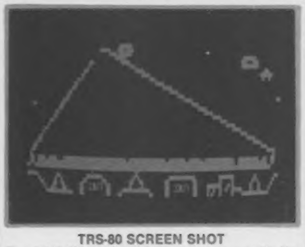

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CIRCLE 106 ON READER SERVICE CARD

Avvv	Set SemiDisk base address (0-248 decimal)
B+	Enable Hyper-Boot
B–	Disable Hyper-Boot
C+	Check for correct SemiDisk hardware configuration
C–	Install without checking hardware configuration
D:	Select default drive for SemiDisk (B:–P:)
M+	Configure for 1 Meg SemiDisk
M–	Configure for 512K SemiDisk
P+	Enable parity checking
P–	Disable parity checking
R	Remove SemiDisk driver
S+	Update SEMIDISK.COM with current options
S–	Install SemiDisk without updating SEMIDISK.COM
V	Display current option configuration
Z+	Enable Auto-Format
Z–	Disable Auto-Format
?	Display list of options

Table 1. SEMIDISK.COM Options.

checking, what disk to call the SemiDisk, etc. The changes made by the user can be temporary to check operation or can permanently modify the SEMIDISK.COM program itself for everyday operation.

A few other utilities are provided to test the board, brute clear and format the disk, etc. They are not normally needed. A program which allows the customized SemiDisk driver to execute upon cold boot to make initialization of the SemiDisk board proceed automatically is also supplied. Otherwise, the user must explicitly execute the SEMIDISK.COM to clear and format the board before use.

My computer is complex, with a card in nearly every slot of the 20-slot motherboard. Operating software is accordingly also rather complicated and has been extensively patched. Thus I was both skeptical and a bit apprehensive when trying the SemiDisk for the first time. I have tried some other hardware and software which "guaranteed" compatibility and been disappointed.

After adjusting the SemiDisk address to non-conflicting ports, but not changing anything else, I ran SEMIDISK.COM. The SemiDisk worked perfectly the very first time! The memory clears and formats in a bit less than ten seconds, and that's it. From then on you have a half a megabyte disk drive that runs *fast.*

How fast? I ran four tests to get a feel for the speed of the SemiDisk compared to 8″ single and double density on my fast Innotronics drives and my 40 megabyte Quantum Winchester. IMS's CPM 2.24E was the operating system. The results are shown in Table 2.

Without battery backup, work in progress is liable to total loss if there is a power failure or serious system crash.

First I tried a linkage with Microsoft's L80 of a long Fortran program. The L80 linker is terribly slow, and I had always thought it must have something to do with disk access. Well, it does, but not to the degree I had expected. The SemiDisk was about twice as fast as a single density floppy; the advantage over my hard disk was only about 20%.

Next I loaded *Wordstar* and a 70K text file and did a ∧QC to go to the end of the file and a ∧QR to get back to the beginning again. Now the differences really began to show up. The advantage of the hard disk over floppies was significant, but the SemiDisk was more than twice as fast again. Comparing the SemiDisk with floppies provided no contest.

Table 2. SemiDisk Speed Tests.

Storage Device	L80 Linkage	WordStar 70K file ∧QC/∧QR	PIP 224K file	1000 record Sequential file I/O
Single Density 8″	1:59	2:54	3:46	1:06
Double Density 8″	1:24	1:54	2:42	:42
Hard Disk 8″	1:07	:59	2:24	:31
SemiDisk	:55	:27	:58	:18

Then I pipped a 224K data file from hard disk to each destination device with verify. Copying from one area of the hard disk to another was disappointingly slow, but this time varied somewhat depending on the surface being copied to. Again the SemiDisk was more than twice as fast as the hard disk.

Finally, I wrote a Basic program which generated 1000 sequential records, wrote them to disk and then read them back in again to simulate a business application. The SemiDisk wasn't quite twice as fast as the hard disk, but its advantage was still noteworthy.

In all cases, the speed gained through use of the SemiDisk compared to hard disk was significant, and even double density floppies couldn't come close. Perhaps even more important, the "feel" of the system was dramatically improved. When I got my hard disk I was quite pleased with the response time, but now I have been spoiled even more by the SemiDisk.

Are there any disadvantages? Yes—two. One is the volatile nature of RAM. Without battery backup, work in progress is liable to total loss if there is a power failure or serious system crash. Saving files to the SemiDisk occasionally, as one would do with a normal disk, just doesn't provide real security. Even though power failures are rare in my area and my system is *very* reliable, I sometimes get a bit nervous when working on the SemiDisk and back up to hard disk or floppy. This can negate at least a small part of the time advantage provided by the board.

The second problem is cost. The retail price of the 512K SemiDisk is $1995, and the 1 meg version costs $2995. These prices can be considered in several lights. Compared to normal S-100 64K memory cards, the SemiDisks are a bargain. IBM PC memory, on the other hand, seems to be available for as little as $600-700 for 256K. Finally, 5¼″ Winchester hard disks have come so far down in price that 5 or even 10 megs of hard disk may be available for less than the SemiDisk. In a system without hard disk, many people would think the hard disk a better first purchase.

But even if the SemiDisk is a bit of a luxury, it is simply a delight to use. It is easy to install and works exactly as advertised. If you work with long compilations, large text files or other serious applications, the SemiDisk will make your life a lot more pleasant.

SemiDisk Systems, P.O. Box GG, Beaverton, OR 97075. □

Dakin5 Controller 1.1

Ron Exner

Controller 1.1. from Dakin5 is an accounting system for the Apple. Accounting systems are complex programs, so perhaps I should give you a bit of personal background information regarding my qualifications to review one.

By education and experience I am first an accountant and second a user of computers. Consequently, when I examine an accounting system I first look for conformity with Generally Accepted Accounting Principles and how well a system fits into the accounting cycle. *Then* I look at how well a system operates from a computer standpoint. I also play "dumb" with the system and see how little knowledge of accounting and computers I can get by on. After all, most people have very little experience with either let alone both.

Briefly, there are two types of accounting systems: accrual and cash basis. The main distinguishing characteristic is whether revenue is recorded in the accounting period in which it was earned or in the period in which it is collected as cash. A parallel question is whether expenses should be recorded in the accounting period in which they are incurred or recognized when they are paid. A business which recognizes revenues in the period during which they are earned and deducts expenses when they are incurred is using the accural basis of accounting.

For example, in March you receive a $100 invoice from Ace Widget Co. for supplies purchased. When you enter this in the Accounts Payable module, Supplies Expense of $100 is recorded and a liability for $100 is entered in favor of Ace Widget. When Ace is paid in April, cash is decreased by $100 and the liability to Ace eliminated.

The important point is that supplies expense is recorded in the period in which it was incurred (March) regardless of the fact that payment is made at a later date (April). The same principle holds true for sales. All sales are recorded as revenue regardless of when they are collected. The positive difference between revenue and expenses is, of course, what being in business is about.

creative computing

SOFTWARE PROFILE

Name: Controller 1.1

Type: Accounting package

System: Apple II 48K, dual drives, 96 column printer.

Format: Disk

Summary: Professional, comprehensive accounting system.

Price: $625

Manufacturer:
Dakin5 Corporation
P.O. Box 21187
Denver, CO 80221
(800) 525-0463

The bottom line, or net income, has meaning only if it is related to a specific period of time. Since income is determined by subtracting expenses from revenue, both the revenue and the expenses used in the calculation must relate to the same time period. This matching of revenue and expenses gives a realistic picture of the profit performance of the business each period. Since accurate income measurement is a major objective of the whole accounting process, the accrual basis of accounting is widely used throughout the business community. However, it is not the only system in use.

The alternative to the accrual basis of accounting is the cash basis. Under cash basis accounting, revenue is not recorded until it is received in cash, and expenses are not recognized until they are paid in cash. Consequently it is not likely that expenses and revenues will be matched to the proper period. This system is limited mostly to individuals and to accounting records of physicians and other professional firms.

Design

Most accounting systems consist of a general ledger with add on accounts receivable and accounts payable modules. The *Controller,* however, is designed as a comprehensive accrual based accounting package. Although any of the three modules, general ledger (G/L), accounts receivable (A/R), and accounts payable (A/P) may be used individually or in conjunction with the others, they are most impressive when used together.

Ron Exner, 309 Potter St.,
Bellingham, WA 98225.

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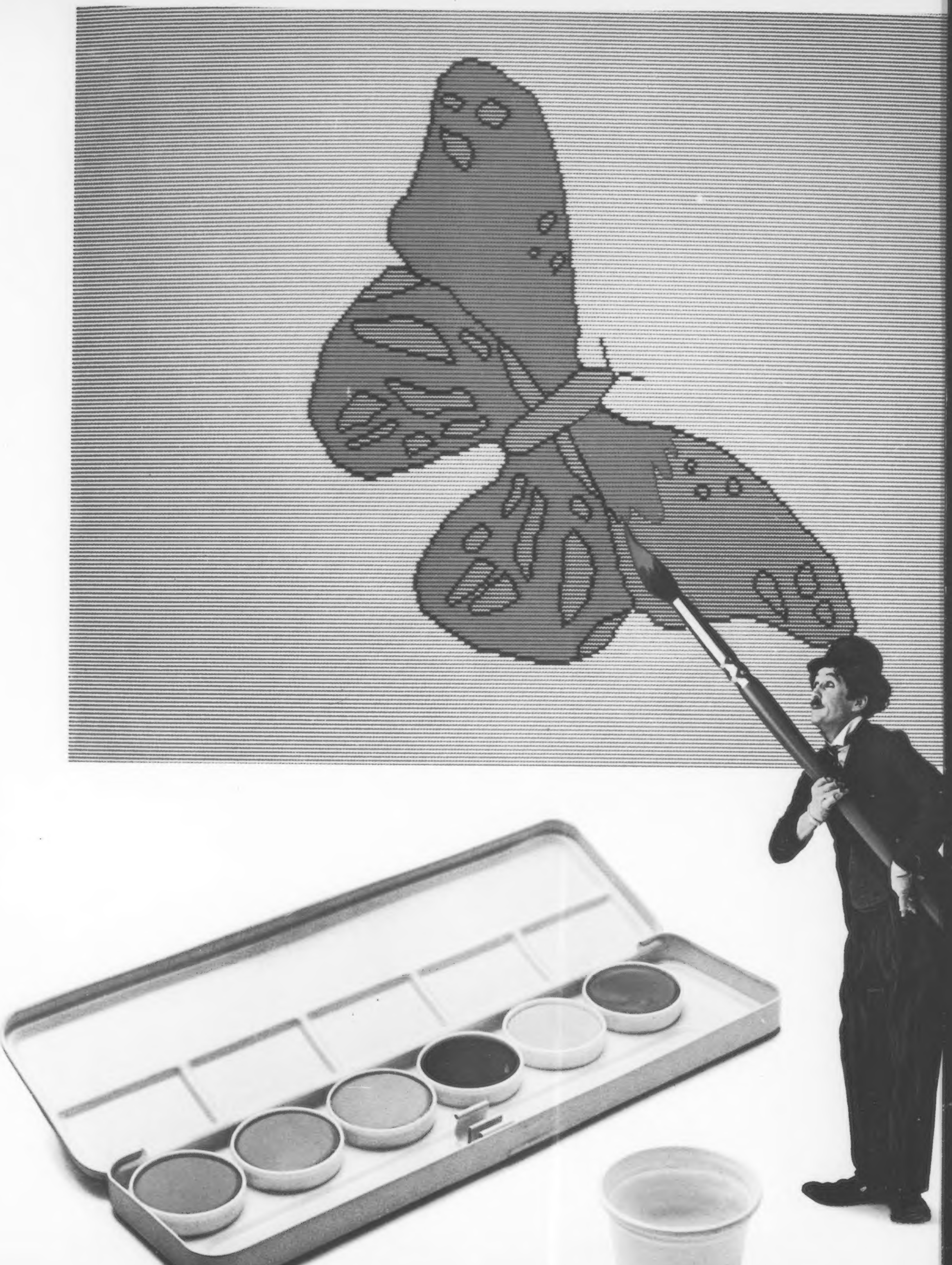

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10-key numeric pad
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Diagnostics
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Parity checking*

Display Screens
Color or monochrome
High-resolution*
80 characters x 25 lines
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CIRCLE 245 ON READER SERVICE CARD

Dakin5, continued...

I must emphasize that this is an *accrual* based system; it is aimed at a business that recognizes income and expenses when they are earned or incurred. If you have a cash based system, *Controller* will be awkward to use. You may want to consider, instead, one of the numerous checkbook management programs.

Controller is an excellent example of the proper use of automation. One small but typical example of the proper use of automation can be seen in the accounts receivable module. To start, you simply insert the master disk, choose accounts receivable and plug in the A/R systems disk. If you pick the wrong disk or put the right disk in the wrong drive, the system notes the error and tells you which disk to put in which drive. In fact, if you are totally confused, (not likely) don't put a disk in either drive and the system will tell you which disk should be in which location. If at any time you don't like a menu option, you can simply press ESCAPE, and you will be returned to the previous menu. If that menu is on a different disk, the system will tell you, for example to "...insert System Disk 006 in drive 1." Of course if you anticipate which disk is needed this message is omitted.

***The Controller** is designed as a comprehensive accrual based accounting package.*

Frequently, a high degree of automation limits the applications of a program. Even as an accountant I find this to be refreshingly *not* the case with *Controller*. Coupled with automatic data disk backups and automatic report generation at strategic times in the accounting cycle, the automatic features of the *Controller* allow you to forget about the possibility of inserting the wrong disk in the wrong drive and bombing the program or wasting your data disk. You concentrate, instead, on just making sure you are providing the right data to the system.

Dakin5 not only provides you with unprotected program disks, but provides a utility system that is used to make backups of the data and system disks. What it comes down to is this, if you are not functionally illiterate and can open a disk drive door without assistance, you can operate *Controller* with confidence.

Features

Without turning this review into a user's manual, the best way for me to give you an idea of the features of *Controller* is to examine its capabilities. Briefly, some of the most distinguishing program and report characteristics are the following:

Accounts Receivable

- Can hold 250 customers per disk with a maximum of 1000 transactions per month per disk. The system will accommodate up to nine data disks, each with its own volume number.
- Identifies up to 100 separate salespeople.
- Accepts sales amounts up to $99,999.99. Accepts tax amounts up to $999.99. This amount must be calculated manually and entered separately on each invoice.
- Allows up to 250 statements per month per data disk.
- Allows a maximum balance per customer per aging period of $99,999.99.
- Allows overall customer balance of $399,999.96.
- Allows sales and payment entries in batches of up to 100.
- Can transfer up to 100 journal entries per disk to the general ledger at one time.

A/R Reports

- Customer Master List: A reference for all customers of your business and their customer number, address, telephone number, discount percentage, last activity, year to date billing and balance due.
- Customer Mailing Labels.
- Sales Journal: Shows a batch register of sales invoices, adjustments, and finance charges entered. Makes an excellent audit trail back to the source document.
- Payment Journal: Reports payments and adjustments made to customers' accounts. Like the Sales Journal, it produces an excellent audit trail.
- Summary Aged Trial Balance: Probably the most valuable tool available for spotting slow or delinquent customers. Shows customer number, name, phone number, aged amounts, and total due.
- Detailed Aged Trial Balance: Similar to the Summary report but it shows customer's balance forward, credits, invoices, payments, and finance charges for the current period.
- Monthly Activity Report: Shows, by customer, the total activity for the month including transaction date; transaction type, i.e. sale, adjustment, etc.; sale amount; other amount; tax amount; total amount; and date each entry is paid.

Get Omni quality for as little as $1.99... even if all you want is a 10 pack.

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Double side/single density	———	______	$34.90	______	$______
Double side/double density	$37.50	______	$37.50	______	$______
Flip/Floppy reversible	$39.90	______	$39.90	______	$______
Plastic library case (in lieu of soft storage box)	$ 2.99	______	$ 3.49	______	$______
Shipping and handling ($2.00 first 10 pack, 40¢ additional 10 packs. Continental U.S. only.)					$______
5% sales tax (Mass only)					$______
☐ Check ☐ COD ☐ Master Card ☐ VISA				Total	$______

Card # ______________ Exp. ________ Name ______________________
System/drive model # ______________ Address ______________________
Tel. ______________ ______________________

CIRCLE 115 ON READER SERVICE CARD

Dakin5, continued...

- Statements: Printed only for customers with balances, and may be produced for specific customers or a range of customers. Each statement indicates the balance forward payments, adjustments, charges and finance charges. The last statement is a summary of all the statements printed.
- Sales Commission Report: Details each salesperson's activities and shows the customer name, sales amount, commission percentage, and total commission for each sale and for each customer.

Accounts Payable

- Holds up to 125 temporary or permanent vendors from whom you make purchases.
- Can print as many as 300 checks in any one month.
- Has the capacity to hold up to 300 open invoices at any one time.

A/P Reports

- Vendor Master List: Similar to the Customer Master List except it lists vendors instead of customers.
- Vendor Labels: Produces vendor mailing labels.
- New A/P Invoice Register: Lists each new invoice in computer assigned voucher number sequence. Shows voucher number, vendor name, vendor number, invoice number, invoice date, check number (if invoice is paid), check due date, discount amount, G/L account distribution, invoice amount to be distributed, total invoice amount, and batch totals for discount amount and for all invoices.
- Accounts Payable Cash Requirements: Based on the due dates of all unpaid invoices, this report gives the total per invoice, total per due date, and running totals for all unpaid invoices.
- Open Invoices by Vendor: Lists in vendor sequence all unpaid invoices. Has the same level of detail as the New A/P Invoice Register.
- A/P Paid Invoice Register: Acts as a check register of all invoices paid during the period. Shows hand written checks first.
- A/P Distribution Journal: Details the dollar amount distributed to the respective general ledger accounts in general ledger account number sequence.
- A/P Disbursement Journal: Provides all the detail you would expect in a simple check register including check number, vendor name, check date, check amount and discount taken, and totals by check amount and discount taken.

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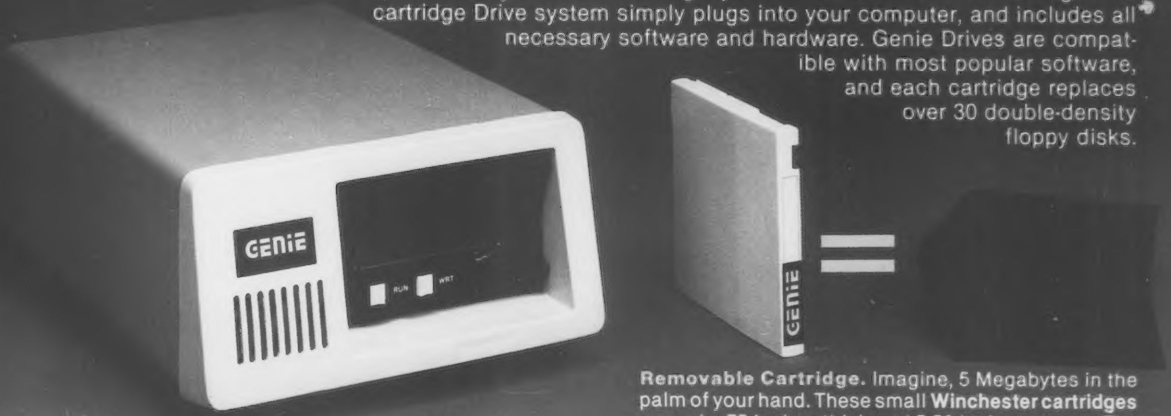

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CIRCLE 177 ON READER SERVICE CARD

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For more information, circle the reader service number below. Better yet, visit your Heathkit Electronic Center for a demonstration!

H-100 SERIES COMPUTER SPECIFICATIONS:

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128K-768K bytes*

MICROPROCESSORS:
16-bit: 8088
8-bit: 8085

DISK STORAGE:
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KEYBOARD:
Typewriter-style, 108 keys, 13 function keys, 18-key numeric pad

GRAPHICS:
Always in graphics mode. 640h/225v resolution; up to eight colors are available**

COMMUNICATIONS:
Two RS-232C Serial Interface Ports and one parallel port

DIAGNOSTICS:
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AVAILABLE SOFTWARE:
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CP/M-85
Z-BASIC Language
Microsoft BASIC
Multiplan
SuperCalc
WordStar
MailMerge
Data Base Manager
Most standard 8-bit CP/M Software

*128K bytes standard.
**Optional.

The H-100 gives me the most for my computer dollar!

CP-217

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CIRCLE 187 ON READER SERVICE CARD

General Ledger

- Can handle up to 250 accounts with a maximum balance of $90,000,000.00 per account.
- Allows standard entries: This feature is used to batch enter amounts that are the same each period. For example, rent expenses and depreciation. You can have a maximum of 100 standard entries.
- Can handle up to 1000 journal entries including up to 100 standard entries per month.

G/L Reports

- Chart of Accounts: May be printed with or without balances. With balances it shows current month balance, current month transaction total, transaction total for next month, and transaction total for third sequential accounting month.
- Chart of Accounts Changes: Shows, in account number sequence, any additions, changes, or deletions to the chart of accounts.
- General Journal Report: Shows all entries that have been made to the general ledger.
- Standard Entries Journal: Shows the current set-up of accounts that can be batch entered into the general ledger.
- Trial Balance: Available in detail or summary format. The detail report must be printed before closing the month in G/L.
- Balance Sheet: Available in summary or detail format.
- Income Statement: Shows sales, cost of sales, gross profit on sales, operating expenses, and net income. Available in summary or detail format.
- Income Statement for Departments: Available in summary or detail format.

As you can see the capacity and report options of the *Controller* are extensive. I worked with this system for several months and with the exception of wanting standardized accounts receivable sales entries, could not think of a feature or report it did not offer.

The capacity and report options of the Controller are extensive.

Setup

Flexibility, which can be lost in the trade for automation, is most evident when setting up A/R, A/P or G/L for a specific business configuration. *Controller* gets around what it gives up in this exchange by being so complete that all the conceivable choices are built in. Consequently there is very little "I wish I could. . . " with this system. If you think you need to, you probably can.

As with most other aspects of the *Controller*, module set-up is simple and complete. In accounts payable, for example, you indicate: fiscal year-end date; current month-end date; complete company address; whether or not you are using the general ledger; whether or not you will be printing checks on your printer, and the account numbers of the general ledger summary accounts to which A/P will post. To top it all off, when you are finished you can generate a printed copy of this setup for future reference.

A similar procedure is followed for accounts receivable and general ledger. All you have to do is follow the simple, easy to understand instructions in the documentation.

I.R.S.
AUDITS
chase

"Come on, now! Explain to the nice man, like you did to me, why I don't have to pay taxes this year!!"

Documentation

Controller comes wrapped in a glossy, white, oversized, three-ring binder with 327 pages of documentation, 24 program and data disks and everything else you could possibly need to make the system work well, including 36 archive disk labels, a user input report, and a handy adhesive label with Dakin5's toll free hot line phone number.

At first the package is slightly intimidating. Then you realize that of the 327 pages of documentation 109 are sample reports and their descriptions, 11 are index pages, and 16 are miscellaneous. The remaining 191 pages are divided between a familiarization tutorial and a setup/reference manual. Each of the two sections is further divided into A/R, A/P, and G/L chapter components. The format for all is basically the same.

In Chapter 5, General Ledger Tutorial, for example, you are first told what you will learn and then how to go about learning it. There is quite a bit of "hand holding" with instructions like "1. Choose selection 1, THE CONTROLLER. . . and press return," but given the complexity of doing the job right, this style is a real confidence builder.

Not only are you told what to do, but equally important, you are told why. When you realize that each option, i.e. to use departments or not; to use A/R and/or A/P or not; to print checks or not, requires instruction and explanation it is amazing that the documentation is as brief as it is.

If at any time you get unusual results or simply don't understand what is going on, just dial Dakin5's toll free hot line for assistance. The staff on the other end is just like the program—user-friendly and professional.

Summary

Here is where I put it all together—the good and the bad. My biggest complaint is the limitation of *Controller* to compatibility with 96-column printers. This excludes the latest generation of popular printers, such as the Epson and Okidata. (I have an Epson MX-80.) Although changing over

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CIRCLE 218 ON READER SERVICE CARD

Dakin5, continued...

to condensed 132-column format allows the reports to fit on the page, not only doesn't it look quite right but, more important, it doesn't overcome the problem of how to produce statements.

The standard form assumes a 96-column printer. However, since the program is unprotected, I simply wrote a brief Basic program that produces blank statement forms and then went into the program and changed the print statements to conform to 80 columns. Using my newly created forms, I succeeded in producing some very attractive statements. Why Dakin5 couldn't have included the same kind of option I don't know.

> ***My biggest complaint is the limitation of Controller to compatibility with 96-column printers.***

If you have the proper printer, you will definitely like the *Controller.* The program is menu driven and proceeds logically from one menu to the next or back to the previous menu without much thought. The automatic design of the program makes user mistakes extremely unlikely and contributes greatly to the overall professional operation of the program. This is true even if the user has limited accounting or computer experience. If you know the difference between .50 and .05 and can read this review, then you have sufficient background to succeed with the *Controller.*

Despite the user-friendliness, excellent documentation, superb support from Dakin5, and bullet proof design of the system, the real strength of this program lies in the fact that it is one element of a family of business programs. For example, I had the opportunity to examine one of Dakin5's latest offerings, the *Depreciation Planner.*

Although this program is not the subject of this review it is important in the way it works with the *Controller.* It not only changes the *Controller* menu options so that it is included, it also automatically posts depreciation amounts to the general ledger and updates the current month, year-to-date, and life-to-date-amounts.

Like the three elements of the *Controller,* the *Depreciation Planner* may be used itself or in conjunction with the *Controller.* The value of this family concept of software is that each member can be used by itself or, when combined with other members, can produce an overall system that is far more powerful than if the members were unrelated. ☐

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CIRCLE 123 ON READER SERVICE CARD

The Ultimate Program?

James F. Yerges

creative computing
SOFTWARE PROFILE

Name: Total Systems Concept
Type: Integrated Work Station
Author: Bob Cretin
System: IBM PC and others
Format: Disk
Summary: Comprehensive word processing, spreadsheet, and communications package
Price: $18.95
Manufacturer:
Bob's Software
P.O. Box 71
Waunakee, WI 53597

The advent of the second generation microcomputers—machines with 16-bit architecture, capable of addressing as many as a million bytes of memory—has significant implications for business. These machines are so fast and powerful that they tend to invalidate the traditional distinctions between micro, mini, and mainframe computers.

This explosion of new hardware has caught the applications software developers with their trousers belted somewhere near the knees. They haven't quite figured out what to do with a "mini-mainframe" so "surprisingly affordable" that it can be planted on the individual business executive's desk like a dedicated digital security blanket.

The trendy buzzword these days in micro software development circles is the "integrated work station" (IWS).

The compatible "Easy" packages from IUS appear to be a nod in this direction. The integrated *MBA* package from CMS probably augurs the wave of the future.

I got a call recently from Bob Cretin, the principal mover and shaker at Bob's Software, a local applications house. Bob asked me to evaluate his new entry into the IWS race—*Total Systems Concept.* At first I demurred, pointing out that I am not, by vocation, a software developer, and that my programming skills are rather rudimentary. I am running almost exclusively canned software on my IBM PC.

Word processing is the mortar between the building blocks of any IWS package.

"Not to worry," Bob assured me. *Total Systems Concept* is aimed squarely at the businessman with little or no "computer literacy." Bob is a believer in the "transparent machine." Anything that requires more than ten minutes to learn fails to qualify as user-friendly in Bob's "operating system." Besides, I was the only guy he knew who had been able to scrounge up the six grand for a PC and letter quality printer (LQP).

A Total System

TSC, as Bob calls it, is a software set consisting of: word processing (*TediousWriter);* spreadsheet *(VisiCrash);* graphics (*Win-Lose-or-Draw);* and communications (*WrongNumber).*

The package shipped is on single-sided 5¼" floppy disks. I questioned Bob about the wisdom of marketing a system, ostensibly for novice computerphiles, that required so much unprompted disk swapping. Bob explained that he is pretty much locked into using ten diskettes until he can solve his media error problems.

I should explain that Bob uses his own proprietary disk media. In an effort to exploit the opportunity of the moment, he has initiated a hardware and supplies division, Bob's Enterprises. He believes that stringent cost controls and competitive pricing are going to separate the survivors from the also-rans in the field of computing supplies.

I will admit that Bob's diskette prices are attractive. At $1.89 a dozen, few other vendors can touch him. However, I have heard it suggested that he has had to make certain compromises in quality to achieve this remarkable economy. Consider, for example, the diskette envelopes and jackets. They look remarkably like the brown kraft paper used in supermarket shopping bags.

On the back side of the envelopes, there are little swatches of what certainly appears to be Scotch Magic Transparent Tape. In fact, the Pastor at St. Bjorn Lutheran Church, in Waunakee, once mentioned to me (more or less in passing) that he thought Ol' Bob might be running some sort of sweat shop up at the Rest Home . . . dozens of old people, frantically cutting and folding and taping supermarket shopping bags . . . but, hey, that's just idle gossip and has nothing to do with this software review.

James Yerges, P.O. Box 71, Wanakee, WI 53597.

Word Processing

Word processing is the mortar between the building blocks of any IWS package. So I first turned my attention to *TediousWriter.* The documentation is, in a word, unique. Perhaps a better word would be concise. It is handwritten, in #2 lead pencil, on the back of the diskette envelopes. Bob says that this approach is more user-oriented, because it eliminates the hassle of separate documentation, which can easily be misplaced, or even lost in mailing.

Bob has, in his words, "busted his cheeks" to minimize the agony of the first-time computer user. He has attempted to make it as simple as possible for the experienced typist to transfer his or her existing skills directly to the computer.

Most of the WP programs currently on the market claim to be either file-oriented or page-oriented. According to Bob, *TediousWriter* is line-oriented. The word-wrap scheme is a good example. When the cursor reaches column 73 of the 80-column display, the IBM PC speaker sounds a remarkably bell-like tone, warning the typist that only seven spaces remain. Striking the return key moves the cursor to the first space of the next line down. According to Bob, this gives the data entry technician (DET) exceptional control over the right margin of the text, including forced hyphenation.

The indentation procedure is equally human-factors-oriented for the converted typist. The DET simply strikes the spacebar five times before typing the first character of a new paragraph. Alternatively, the tab key can be set to perform the same function with a single keystroke.

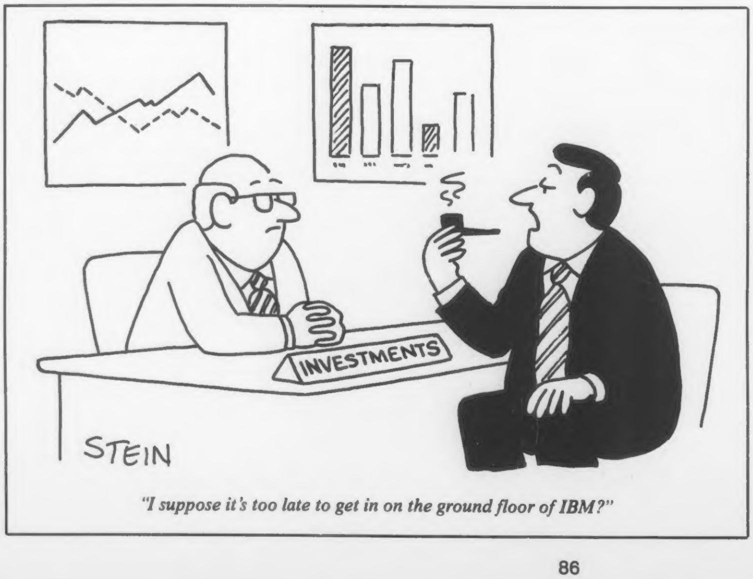
The pagination procedure is of the what-you-see-is-what-you-get school. First, the DET fills the 25-line screen of the standard IBM PC display with text. Then, a sheet of paper is inserted into the LQP. (I used a 25 cps C. Itoh Starwriter, but it probably doesn't make a heck of a lot of difference.) Then, the arrow up key and the PrtSc key are pressed simultaneously, to dump the entire contents of the screen onto the page.

Next, additional lines of text are typed onto the screen until the original 25th line scrolls off the top, and the paper dump procedure is repeated. According to Bob, page length and top and bottom margins are totally under the control of the DET by virtue of hands-on control of the sheet of paper in the LQP.

> ***I would have been willing to invest a bit more time in learning macro-instructions initially, in order to save time and effort later on.***

I asked Bob what induced him to utilize this countertrendy approach. "Experience," replied Bob. This algorithm enjoyed years of success, according to Bob, on the legendary IBM Selectric. Even before that, it was successfully executed on the pioneer IBM Executive.

I can't quarrel with the fundamental premise on which Bob designed this piece of software. It was very easy to conceptualize. However, I found it somewhat tedious to execute. I would have been willing to invest a bit more time in learning macro-instructions initially, in order to save time and effort later on. But that is just my personal viewpoint. I could be wrong.



"I suppose it's too late to get in on the ground floor of IBM?"

Consider this: Bob doesn't believe that the ten extra function keys on the PC keyboard are a good idea for the business user. In fact, Bob's Enterprises offers a prefabricated cardboard mask to cover almost all of the non-standard keys not found on a typical typewriter. (The Simplifier, from Bob's Enterprises, P.O. Box 71, Waunakee, WI 53597. $8.95. Send cash or money order—no personal checks.)

I asked Bob if the package uses DOS files, or some other scheme. He explained that *ITC* doesn't have a file system yet, but it should be coming in an update pretty soon.

Graphics

Graphics is an area in which I have very little experience, and even less equipment, but I am currently lusting after several of the multi-color plotters that have reached the marketplace at under $2500. So I decided to give *Win-Lose-or-Draw* a try. At least I could watch it strut its stuff on the CRT.

Once again, in this program, Bob has placed great emphasis on immediate accessibility for the first-time user. The screen represents a master 80-columns wide and 25-rows high. The cursor can be moved to any location within this coordinate array with the four cursor control arrow keys. (There is a sort of a little trap door in the cardboard Simplifier mask that opens to expose these extra keys.)

Any of the standard keyboard symbols may be inserted at any location by moving the cursor to the desired position and striking the appropriate key. This, according to Bob, gives complete flexibility in the design of graphs, charts, and so forth, without the use of confusing or difficult curve fitting or plotting routines. Once again, the arrow-up and PrtSc keys are pushed simultaneously to begin printing.

Spreadsheet

I set the graphics software aside, and turned my attention to the spreadsheet program. Frankly, when I booted the *VisiCrash* program, I felt that uneasy sense of embarrassment that I experience when face-to-face with a blatant ripoff. This spreadsheet program is pretty obviously a look-alike to that Gran'Daddy of them all, Visi-what's-its-name. I quickly keyed in a fairly trivial

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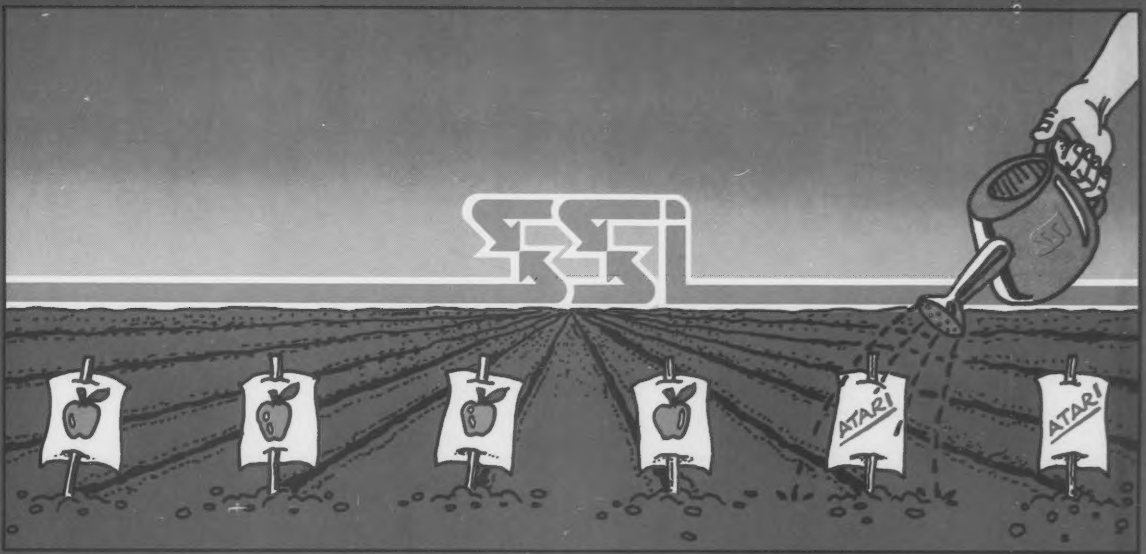

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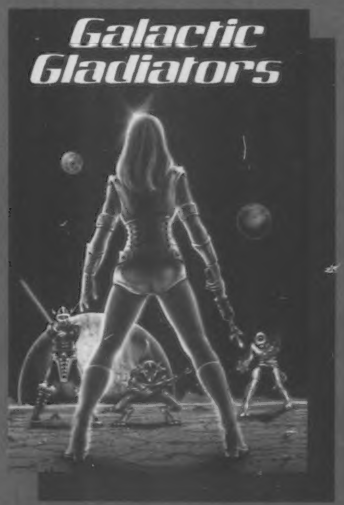

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CIRCLE 129 ON READER SERVICE CARD

example problem, just to watch the piece work.

The first time I asked for a recomputation of the sheet, I was rewarded with a display as surprising as it was aesthetically fulfilling. Waves of alphanumerics cascaded down the screen. A frantic, frenzied scrolling occurred, employing every character in the PC repertoire. And the colors! The incredible diversity of shades and hues was breathtaking.

I found this especially interesting, since I have only a standard monochrome display.

I could easily have watched that display for hours, but I began to detect the tell-tale scent of smoldering bakelite, so I stopped the program execution by striking the Ctrl and Break keys simultaneously. The PC took less than half an hour to cool down to where it was safe to use again. I don't think the slight thermally-induced warping of the boards is going to be a significant problem.

Communications

I must express certain reservations about the communications program, *WrongNumber.* I booted the first disk, and as I waited for the first prompt to follow the Bob's Software logo, the disk drive began to chatter furiously. I have never seen such emphatic software incompatibility. The standard Tandon-built drive sort of puckered up its little trap door, emitted an unmistakably anthropomorphic sound (sort of a ptooi!) and violently regurgitated the diskette, which struck me near the corner of my right eye, inflicting a nasty paper cut. I did not attempt to re-boot the disk.

> ***I felt that uneasy sense of embarrassment that I experience when face-to-face with a blatant ripoff.***

After I got the bleeding stopped, I called Bob and asked him about this bug. He said that it would be fixed in a future version, which would also include a lot more of the features found in other packages. For example, there will be a database called *Misfiler,* and even an arcade-style game called *HemaRoids* (Bob's spelling). I asked him when we could expect to see the update, and he explained that he couldn't be sure. Computerland East said he couldn't use their IBM PC demo unit anymore unless he bought something.

At $18.95, *Total Systems Concept* is definitely competitively priced. However, I would like to see some of the promised refinements before I could wholeheartedly endorse the package. I understand the importance of timing in securing a share of the market, but I am afraid that Bob may be trying to move too fast.

I also think he should consider releasing versions for more of the popular machines. At the moment, *TSC* is available only for the IBM PC, the Instructional Assembly Language Simulator at Madison Area Computing Center, and the Hybrid Computer on the tenth floor of the Engineering Research Building of the University of Wisconsin. I am afraid that this is going to limit demand for the package. ☐

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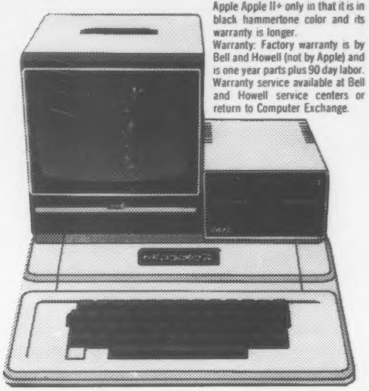

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CIRCLE 146 ON READER SERVICE CARD

A Master Looks At Computer Card Games

Ken Uston

The Card Stars—Cribbage and Solitaire

The instructions that come with this package make the point that video games tend to come and go, since they eventually lose their appeal to players. On the other hand, some card games, such as cribbage and solitaire, have been played for centuries by millions of players.

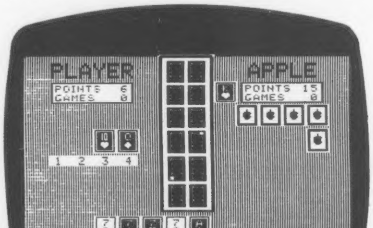
That point would appear to establish the need for a computerized version of these games. With cribbage, a competitive game played against other players, this certainly makes sense; the computer provides a handy opponent, available whenever one feels like playing.

However, I question the need for computer solitaire. The four solitaire variations on this program are authentic portrayals of their pasteboard counterparts and are indeed quite playable. However, are these programs really necessary? I, personally, would prefer to play solitaire with actual playing cards—they can be moved around more easily, without referring to computer codes, they're easier to read, and I, for one, enjoy the tactile experience of handling and shuffling the cards.

Cribbage

Datamost has come up with a winner in its cribbage game. The display is colorful, with an attractive green background, a cribbage board in the center of the screen, and the player's and Apple's cards on either side.

The play of this game is faster than if playing cards were used. Dealing is computer-rapid, and the computer further speeds up the game by rapidly calculating the value of each of the hands and the Crib—not an easy task.



It would be difficult to play this for very long without getting much better at the game. Aside from getting more knowledgeable through more playing, the player can also observe which cards the computer saves for the crib and how the cards are played on the field.

This version of cribbage has significant differences from the cribbage game developed for the Atari by Thorn EMI Video Programmes Ltd. Despite the Atari capability for colorful graphics, surprisingly the Apple version is in color, and the Atari version is not. The Apple package does a lot of the work for the player, such as calculating the total on the field and displaying the total score. While this makes for easier playing, the Atari package more closely resembles playing in a card game, where the player, of course, must do these calculations.

Several other options assist the player in learning the game. He may ask the

creative computing

SOFTWARE PROFILE

Name: The Card Stars—Cribbage and Solitaire

Type: Card Games

System: Apple II

Format: Disk

Summary: The standard game of cribbage, played against the computer, and four variations of solitaire.

Price: $24.95

Manufacturer:
Datamost
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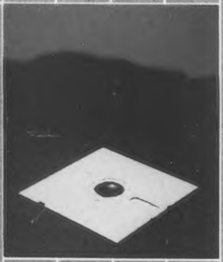

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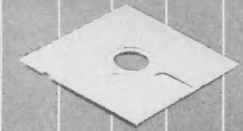

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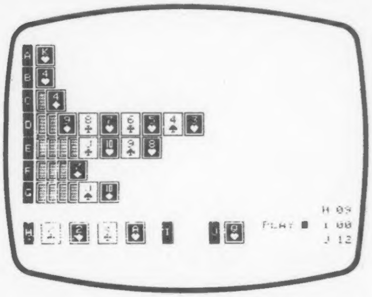
Apple Games, continued...

computer to display all combinations of four cards out of the six he is dealt, which helps in determining which two cards to discard for the crib. The player may also delay play for a while or halt the game to give him time to evaluate point calculations or strategy.

Solitaire

We are offered four versions of solitaire:

Klondike is the popular version of solitaire that we all played as kids. We deal out seven piles of cards; the first pile has only one card, and each succeeding pile has one more card than the previous one. The cards are played in columns on the piles, in decreasing denomination and alternating color, and removed to form four packs, one for each suit, ordered consecutively starting with the ace. The undealt cards are turned over one-by-one, and the player may use them as appropriate. He may go through the pack only once.



Klondike Variation is the same as Klondike, except the undealt cards are turned over three at a time and the player may continue running through the pack until he has no more moves.

In Picture Frame Solitaire, the cards are arranged in a four-by-four square. The objective is to put all 12 picture cards in predesignated locations around the periphery of the square.

For Pyramid, a 28-card pyramid is formed, the goal is to remove as many cards as possible from the pyramid. Only two-card combinations totaling 13 may be removed (kings are automatically removed since their assigned value is 13).

At first, the games play quite slowly because it is necessary to learn the computer coding in order to move the cards around. After a few games, however, this comes almost automatically.

I suspect that most players would rather play solitaire in the traditional way, than use this program. This is because the cards are much smaller than conventional playing cards, and the suits are more difficult to identify because of unrealistic color contrast.

Solitaire, indeed, reflects a computer

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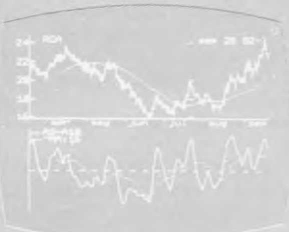

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CIRCLE 206 ON READER SERVICE CARD

programming accomplishment of the highest order, but there is serious doubt in my mind whether these games have significant practical value.

Gin Rummy

This package, I believe, fills a real need. Have you ever wanted to play gin rummy, but couldn't find someone to play with? Or maybe, really wanting a gin rummy fix, you figured you might as well play a game with your kid sister, and instead of enjoying a game, you end up as an instructor for hours on end.

Well, Datamost has solved this problem with their *Computer Gin Rummy* package. The Apple owner can now play gin any time he wants, day or night, against a quite capable opponent.

The player selects from one of three gin games: the standard game that we all know so well, in which players can knock for 10 points or less; Knock, in which the players may knock at any time during the game and there are no "lay-offs" (i.e., playing one's cards on the other player's hand); and One-meld, in which the players cannot knock, but must keep playing until they "get gin."

creative computing

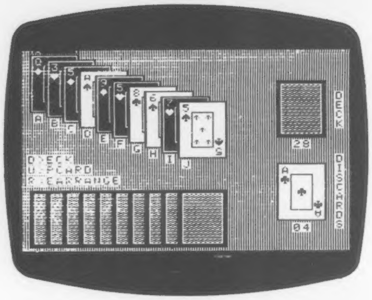
SOFTWARE PROFILE

Name: Computer Gin Rummy
Type: Card Game
Author: Art Carpet
System: Apple II
Format: Disk
Summary: Three gin rummy games
Price: $29.95
Manufacturer:
Datamost
9748 Cozycroft Ave.
Chatsworth, CA 95827

The program allows the player to arrange his hand in any way he wants, at any time he wants. This is done by assigning letters to each of the cards. At first it is a bit confusing to input the data, but after a few hands, it becomes almost routine.

The player's cards are displayed face up at the top of the screen; the computer's hand is shown below, face down. The discard pile and unused deck are displayed at the right. The player is well-prompted through the entire process.

When either the player or the computer knocks, both hands are displayed face up on the screen; the computer arranges the player's meld so that he will have the lowest possible point count. If the player chooses to play his hand differently (I wouldn't advise it), he is allowed to do so.



The program provides a helpful learning assist in the gin no-meld option. After each hand, the player may request a "summary"; the two hands are displayed, as are each of the cards in both the discard pile and the unused deck. In this manner, the player can conduct a "post mortem" and evaluate how he (and the computer) played the hand.

At first, the player will probably destroy a few games. This, of course, can be quite frustrating, particularly in the middle of a close game. But that's the price one must pay to have a permanent gin rummy opponent, any time, day or night, rain or shine.

Apple 21

After playing a number of poor adaptations of blackjack on home systems,it is a pleasure finally to run into one that's authentic. Most of the other versions unrealistically restrict the players' options. *Apple 21* does not.

After the title screen is displayed, we are given the option of playing at a $1, $2 or $5 table. These have limits of $1 to $100, $2 to $200 and $5 to $500, respectively. I tried betting $1 at a $2 table and was reminded, "minimum bet is $2"; when I tried to bet $300, I was told, "table limit is $200." When I tried to bet more than the amount remaining, I was told,"You're out of your league!!"

creative computing

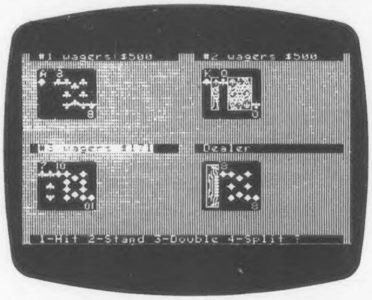
SOFTWARE PROFILE

Name: Apple 21
Type: Casino Blackjack
Author: Bill Depew
System: 24K Apple, disk drive (36K minimum for Disk II)
Format: Disk
Language: Integer Basic
Summary: A totally authentic version of the casino game of blackjack or "21."
Price: $24.95
Manufacturer:
Softape
10432 Burbank Blvd.
North Hollywood,CA 91601

The game is played with one deck of cards (eight decks are currently used in Atlantic City, but single deck games can be found in Nevada). We hear the deck being shuffled and are reminded, "You're tapped. Need a loan?" When we admit that we do, we are asked "How much? (1 to 1000)?" (I once responded, "No," and was told, "we're even #1 . . . GOODBYE," and was dealt out of the game.) This program means business.

The players (from one to three are allowed) place their first bets and the game begins. Each player's two cards are dealt face-up. The dealer is dealt two cards, one face up and one face down.

Players have the option of hitting (drawing additional cards), standing, doubling down (doubling the amount of the bet and taking only one more card), or splitting pairs (making two hands out of a hand with two cards of equal rank).



After splitting a pair, the player may split again, up to a maximum of four hands. If the dealer has an ace upcard, the players may make an "insurance" side bet, which pays 2-to-1 if the dealer has a blackjack (ace and a ten or face card). I have never seen a home blackjack game with as complete a set of player options (and I have played just about every one that has ever been produced).

The graphics are fine; the backs of the cards are in multi-colored detail, and the screen background is simulated green felt (what else?). The amount that each player has is displayed after each hand.

If you run out of money (you cannot bet more than you have), you are offered an additional loan. If any player chooses to leave the game, he enters a bet of "0"; he is told how much he has won or lost and "goodbye." The game continues for the remaining players.

About the only blackjack playing I do these days is on a computer (I'm not allowed to play blackjack in Nevada; although I won a lawsuit and am now allowed by law to play in the Atlantic City casinos, the rules there are too tough). *Apple 21* is the most realistic simulated blackjack game I have seen to date. ☐

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Little Miss Muffet sat on a tuffet
Eating some curds and whey
Along came a spider
Who sat down beside her
And frightened Miss Muffet away
```

There is a colorful 11" x 17" "Micro Do's and Don'ts" poster, and you will also find a 16-page manual that describes the contents of the disk and discusses "family computing."

We are told in the literature that the disk is "kid tested and child-friendly." It is, indeed. It is only necessary to use two keys. The space bar selects items on the pictorial menu, and the RETURN key starts a program running.

Each of the nine nursery rhymes starts with a colorful graphic on the screen. Next, the words to the rhyme appear. After that, the tune of the rhyme plays through the Apple speaker.

Many times in these pages, we have recommended that an external speaker be substituted for the internal Apple speaker. At the risk of being redundant, we again recommend that substitution. You will be amazed at the difference a $7.95 extension speaker from Radio Shack makes in the sound of your Apple. Played through such a speaker, these nursery rhymes will have the whole family singing along in no time flat.

Two of the games on the disk are based on "big people games." "London Bridge-Out!" is a slowed down version of *Break-Out.* It starts with two rows of ten bricks each and a wonderful spinning ball (you can even see the spin). The movement is slow enough that even a three-year-old will have no trouble hitting the ball two or three times with the large paddle at the bottom of the screen. However, on each level of the game, there are more bricks and the ball moves slightly faster. At higher levels of play, the game is a challenge for even the most accomplished *Break-Out* player.

The second game, "Splat!" is similar to *Kaboom* or *Popcorn.* You have a basket at the bottom of the screen which must be moved back and forth to collect six eggs which are dropped from the top. When you have successfully caught a half-dozen eggs, they hatch, and little chicks emerge. The game ends after 100 eggs have fallen. The number of eggs you have successfully caught and hatched appears as your final score on the top of the wall.

The third game, "Lamb Scramb!" is the easiest to play. The object is to get all of Mary's stray lambs safely through the hedge at the left side of the screen and back to Mary. The lambs move around on the right side of the screen. When one is parallel with a hedge opening, you press the button on paddle 0 and the lamb scoots over to Mary. If you misjudged the lamb's position, it simply bonks its head, bounces back, and continues its up and down motion.

If all three of your lambs make it through the hedge, you are a winner, and Mary's lamb song plays as her garden springs up all over the screen.

creative computing
SOFTWARE PROFILE

Name: Micro Mother Goose
Type: Games and graphics
Author: Sina Pettis
System: 48K Apple
Format: Disk
Summary: Games and nursery rhymes for pre-schoolers
Price: $39.95
Manufacturer:
Software Productions Inc.
2357 Southway Dr.
Columbus, OH 43221
(614) 486-3563

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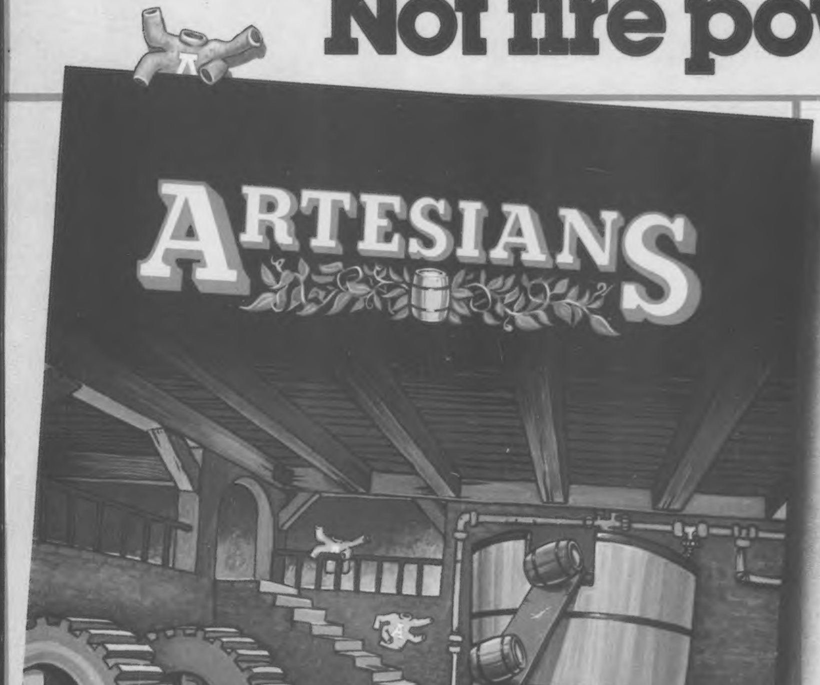

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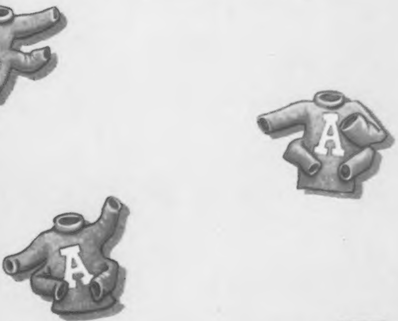
Artesians is a high resolution arcade style video game written for the Apple II, Apple II+, and the Atari 400/800 home computer. Available from computer stores or direct from Rena-Soft, 1070 Shary Circle, Concord, CA 94518. (415) 676-5757

Artesians. $34.95. Requires 48k.



Rena-Soft

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CIRCLE 252 ON READER SERVICE CARD

All in all, *Micro Mother Goose* is a delightful, wholesome disk of games and nursery rhymes. The graphics are excellent, the packing professional, and the games fun. We also applaud Software Productions for making this a non-protected disk so you can back it up without fear of losing the original. While this makes it easy for pirates to copy, we think that most parents will want to get the stickers, poster, and instruction book and thus will be willing to pay for the original product. Sina Pettis of Software Productions promises us more "classic family software" packages, and we are looking forward to them.

PDI Preschool Library

The *PDI Preschool Library* consists of a set of four tape cassettes (or disks and audio cassettes) and a 12-page booklet. Its purpose is "to help three-to six-year olds develop certain critical skills that will be needed when they start school." These skills include shape, number, and letter recognition; the concept of same and different; directional concepts; listening; and hand-eye coordination.

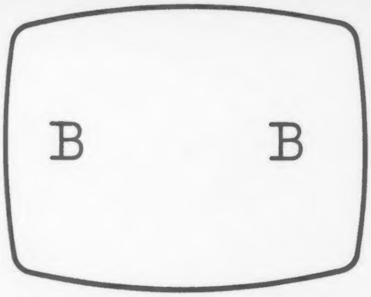
The four titles in the package are: Preschool IQ Builder 1 and 2, Sammy and the Sea Serpent, and The Adventures of Oswald.

Typical of the 16 programs in the IQ Builder series is "Same and Different." Two figures appear on the screen. If they are the same, the joystick must be pushed forward; if they are different, it is pulled back. Reinforcement, in the form of a cute song, is given to correct responses. Pushing the joystick button will display the score to that point.

"Sammy" and "Oswald" are interactive stories. Sammy is a sea serpent who gets separated from his parents in a stormy sea. He is thrown onto the land and wants to return to the sea. By listening to the narrated story and following the directions, the player can move Sammy with the joystick through a town, a garden, and various other places, until he eventually returns to the sea.

creative computing
SOFTWARE PROFILE

Name: PDI Preschool Library
Type: Skill Building
Authors: John Victor, et al.
System: 16K Atari
Format: Cassette or Disk
Language: Basic
Summary: Stories and games to build basic skills
Price: Cassette $59.95; Disk $89.95
Manufacturer:
Program Design, Inc.
11 Adar Court
Greenwich, CT 06830



The narration is excellent and employs appropriate music to go along with the computer images. The animation is simple, yet compelling. Children get very wrapped up in trying to help Sammy and are particularly anxious when he shrinks from lack of food. Fortunately, several obliging bugs, which can be caught by Sammy under the guidance of the player, flutter onto the screen.

The booklet suggests appropriate

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reinforcement activities for you and your child that will expand on the concepts presented on the computer. In summary, we found the *PDI Preschool Library* a valuable and highly motivational tool for helping build important intellectual skills.

Early Elementary Disk I

Early Elementary Disk I is a series of four programs designed for pre-school through the second grade. The programs include "Count the Shapes," "Color Match," "Number Drill," and "Shape Match." In addition, the disk includes a teacher management file which allows the programs to be personalized and tailored to the age and ability of the students.

When the disk is loaded, a menu which allows the user to select any one of the four drill programs or the teacher management file appears. Upon selecting a drill program, some simple instructions are presented followed by a screen which asks the student to type in his name. Our experience with young children is that they are likely to type just about anything. Unfortunately, the error trapping routines in the program are not designed to catch garbage responses and so a name such as &%$# will produce the message "Illegal quantity error in 7560" and return the program to the Basic monitor.

Assuming the user does type his name correctly, the program uses it in various reinforcement messages throughout the lesson. Unfortunately, because these messages are in high-resolution graphics, the user's name can be a maximum of only six letters. Any name of seven or more letters is abbreviated to the first five followed by a period. As a result, users wind up being called names like Steph, Antho, Cathe, Rebec, Micha and Jenni.

Okay, so tell the kids to use nicknames and let's get on with it. The presentation of the four drill programs is more or less similar. An image appears in the top half of the screen. This can be a number of blocks, a color, a number spelled out, or one of seven different shapes. Every three seconds, the image in the bottom part of the screen changes. Eventually it matches (or is the right answer for) that on the top of the screen. In other words, if there are four blocks in the top part of the screen, the bottom part of the screen will show a numeral. Every three seconds, a different one appears. The student must press any key on the keyboard when the correct number appears. Well, not quite *any* key. Obviously, RESET is a no-no. But so is beating on the keyboard, as that will most likely result in the program blowing up with the message "Syntax Error."

creative computing
SOFTWARE PROFILE
Name: Early Elementary Disk I
Type: Drill and practice
Author: Charles James
System: 48K Apple
Format: Disk
Summary: Drill for K-2
Price: $29.95
Manufacturer:
Compu-Tations
P.O. Box 502
Troy, MI 48099

Apple Education Packages

Title	Age	Subject
Micro Mother Goose	3-8	Early skills
PDI Preschool Library	3-6	Early skills
Early Elementary I	4-8	Early skills
Facemaker	4-8	Early skills
Bumble Plot	3-8	Numbers skills, logic
Mop Town	4-Adult	Logic
Match Game	7-Adult	Format to present drill and practice
Tic Tac Show	7-Adult	
Big Math Attack	7-14	Arithmetic
Multiploy	7-14	Arithmetic
The Arithmetic Classroom	7-14	Arithmetic
Edu-Ware Fractions	10-15	Fractions
Read and Solve Math Problems	9-15	Math word problems
Word Families	7-11	Word recognition
WordMate	7-11	Word recognition
Pal Reading Curriculum	8-13	Reading
Vocabulary Baseball	9-Adult	Vocabulary
Magic Spells	9-15	Spelling
Scramble	9-15	Spelling
Word Scrambler & Super Speller	9-15	Spelling
How to Read in the Content Areas	10-15	Reading
Fundamental Skills for Chemistry	15-18	Chemistry
Chem Lab Simulations	15-20	Chemistry
Weather Fronts	9-14	General Science
Tell Star	15-Adult	Astronomy
Understand Yourself	14-Adult	Self-analysis
Lovers or Strangers	17-Adult	Self-analysis
Atari Education Packages		
Facemaker	4-8	Early skills
Golf Classic & Compubar	8-12	Graphs, angles
Snooper Troops	11-Adult	Note taking, reasoning

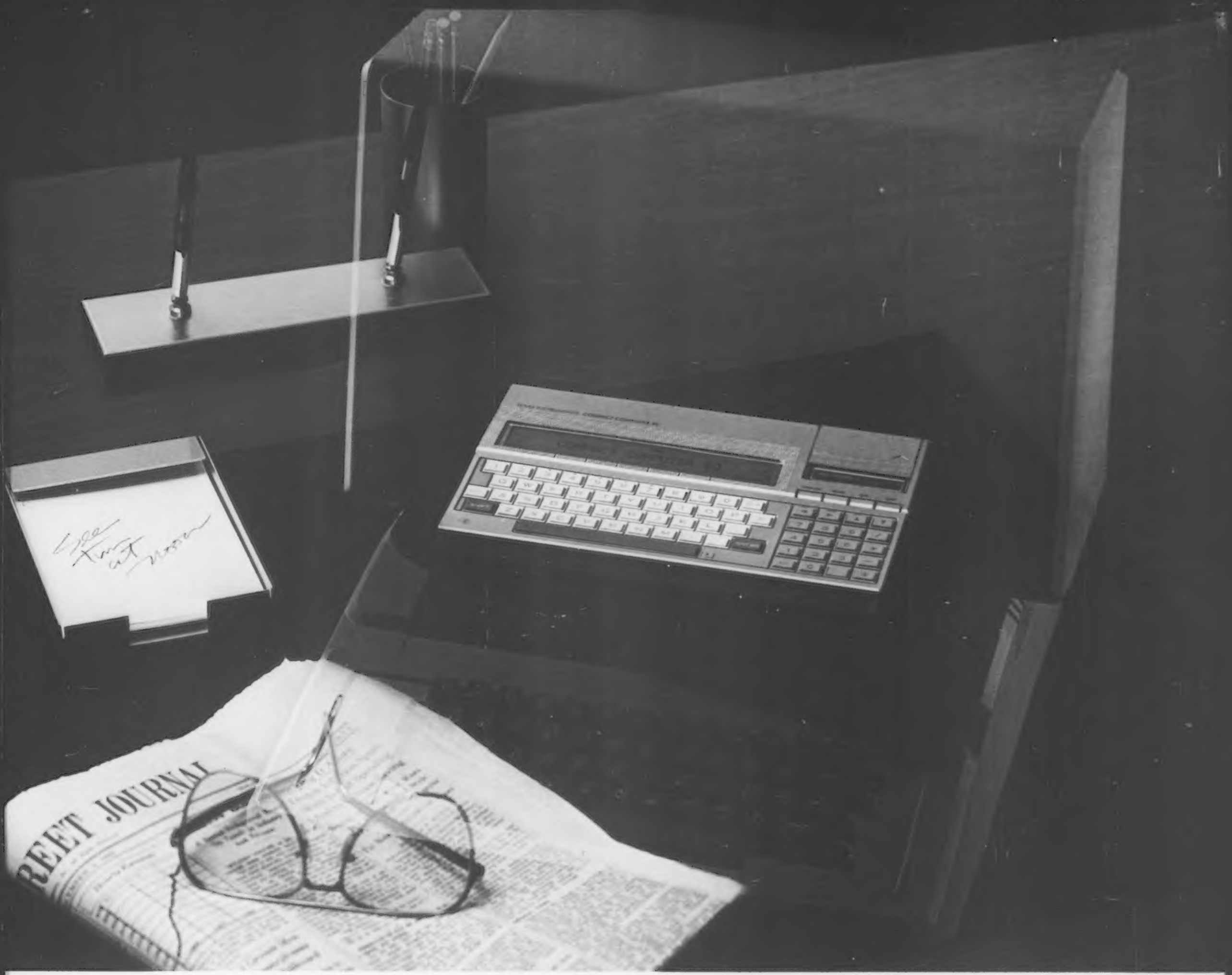
However, assuming our users are well-behaved and press the right answer, they are rewarded with a word such as "great," "right," "good," or "super" followed by some beep, bop, boop sounds and a happy face with a blinking eye. A wrong answer brings on a frowning face and no sounds. At the end of ten problems, a final score is given such as "10 right, 3 wrong." The program then asks if you wish to return to the menu. We found it somewhat disconcerting that some responses must be followed by a RETURN, for example, the question to go back to the menu, while other responses did not require a RETURN.

The teacher management file allows the user to adjust the number of problems (the disk comes set with ten to a session), turn the music on or off, turn the record keeping on or off (up to 35 students), view, delete, erase, or print the class file and vary the speed of presentation.

In summary, the concept of *Early Elementary Disk I* is very good, but the execution, particularly the error trapping routines (if there are any), leave much to be desired. Thus, we can only recommend this disk when it is used under the close guidance of either a parent or teacher.

Facemaker

Facemaker is a program designed to introduce young children, ages 4 to 8, to the computer keyboard and rudimentary programming. The program is menu-driven and easy to use.



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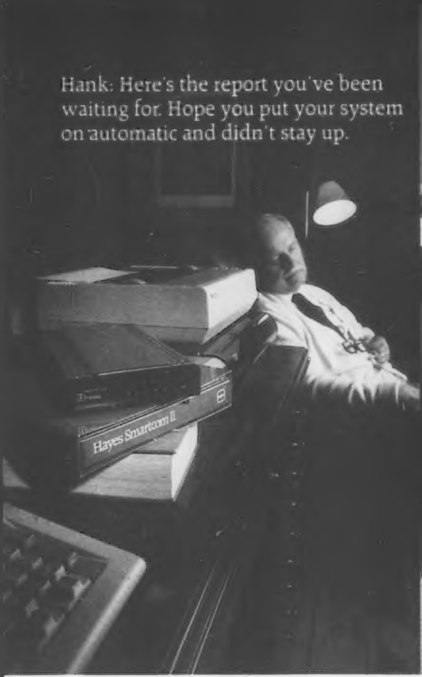
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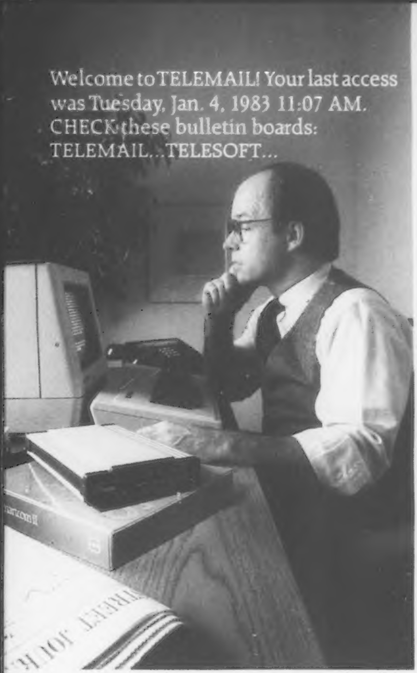
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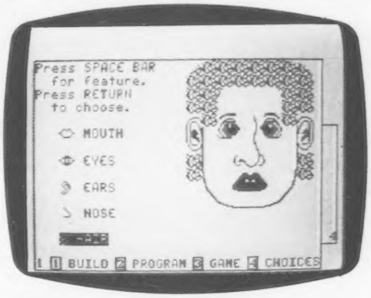
CIRCLE 186 ON READER SERVICE CARD

To build a face, you press 1. Then you select various facial features: mouth, nose, eye, ear, and hair. For each feature you have eight choices. You simply sequence through the choices with the spacebar and select the desired one by pressing RETURN. That element is then added to the face growing on the right half of the screen.

At the Australian Computer Conference in Tasmania, Tom Stonier demonstrated a similar program with me as the model. The students took great delight in making choices for the facial features exactly opposite my actual features. My image wound up having small, beady eyes; a bulbous nose; a large, droopy moustache; huge ears; and no hair.

Once a face is constructed, a primitive program (more like a Logo procedure) can be written to make the face smile, wiggle an ear, frown, pause a moment, wink and, finally, stick out its tongue.


Press SPACE BAR
for feature.
Press RETURN
to choose.

In the past, I have suggested that a "programmable" toy such as Big Trak is a good pre-introduction to Logo. Now, here is another with the advantage that it runs on the same computer. Incidentally, Spinnaker has recently introduced *Delta Drawing,* a drawing and programming tool easier to use than Logo but with many of the same educational qualities. (We'll have a feature review of this package in an upcoming issue.)

Mode 3 on *Facemaker* is a memory game. The face starts by doing one thing, say wiggling an ear. You must press E. It then does two things, say wiggle an ear and smile; you must press ES. The sequence gets longer and longer as the game progresses. Correct answers are rewarded with a pleasant sound while an incorrect answer elicits a Brooklyn razz.

Facemaker is an interesting and highly motivational introduction to the computer for young children. The approach is clever and the graphics outstanding.

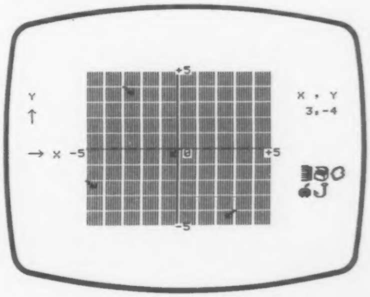
creative computing
SOFTWARE PROFILE

Name: Facemaker
Type: Educational game
System: 48K Apple, Atari, IBM
Format: Disk
Language: Machine
Summary: Draw funny faces
Price: $34.95
Manufacturer:
Spinnaker Software
215 First St.
Cambridge, MA 02142
(617) 868-4700

Bumble Plot

The *Bumble Plot* disk is one of a series of learning games for pre-school and elementary age children from The Learning Company. Each one is attractively packaged in an accordion-fold jacket and comes with a full color, 12-page manual. The outside of the package states the learning objective and age range. For example, the *Bumble Plot* package reads, "Five challenging games that teach number lines, negative numbers and graph plotting. Ages: 8 to 13."

Bumble is a friendly green bug who acts as a guide to the child using the learning activities on the disk. In the first game, "Trap and Guess," Bumble thinks of a secret number in the range of -3 to 3. On the screen is a display that looks something like a ruler with gradations varying from -3 to +3. You first try to trap Bumble's number.



Let's say you type in -2 and 1. In this case, Bumble draws a purple trap around the numbers in that range and tells you whether the secret number is inside or outside of the trap. If it is inside, you can either type two numbers to make the trap smaller or try to guess the secret number. If the secret number is outside the trap, you must type two numbers to make a new trap.

"Bumble Bug" is a similar game, but it is played in two dimensions. In this case, the Bumble Bug is sitting on a grid which varies from -2 to +2 in both X and Y directions. You specify where you want a trap, and the Bumble Bug hops

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CIRCLE 231 ON READER SERVICE CARD

Learning Can Be Fun, continued...

one space. Eventually, when he has no place to go but into your trap, you win.

In "Hidden Treasure," a larger grid, varying from -5 to +5 in both directions, is used. In this case, you are trying to guess the location of buried treasure. After each guess, Bumble tells you whether to make your X number larger or smaller and the same for your Y number. After you retrieve six treasurers, a cute little graphic is shown of Bumble rowing them back to shore. This is a particularly good feature of all of the games from The Learning Company; correct responses are rewarded and incorrect ones are not. Much of the educational software on the market is deficient in this regard. It is frequently more fun to lose the game than to win it.

creative computing
SOFTWARE PROFILE

Name: Bumble Plot
Type: Educational Game
Author: Leslie Grimm
System: 48K Apple
Format: Disk
Language: Machine
Summary: Makes learning fun
Price: $60
Manufacturer:
The Learning Company
4370 Alpine Dr.
Portola Valley, CA 94025

The other two games on the disk enlarge upon the concept of grids. "Bumble Art" is a sort of connect-the-dots game played on a grid varying from -10 to +10. "Roadblock" is a game in which you must catch a moving bank robber with five moveable roadblocks. Each move is timed, but if you have learned your lessons well on the previous four games, winning this one shouldn't be too difficult.

With some of the other games from The Learning Company, light cardboard strips or key covers are included to divide the Apple keyboard into, for example, right, left, up and down.

Upon returning a warranty/registration card to The Learning Company, you receive a set of activity cards for each disk purchased. Each set consists of four double sided 5" square cards with games and activities that reinforce the computer programs. This is a thoughtful touch; while The Learning Company gains a mailing list, you get a nice extra for your time and stamp.

The Learning Company has done an excellent job with their entire line of games, and we give them an A+ on everything except their replacement disk policy. They charge $12 for a back-up disk which, in light of the fact that most

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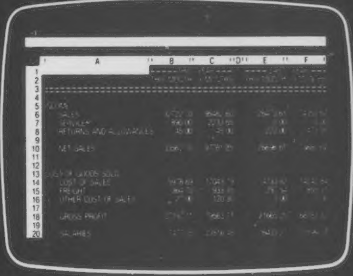

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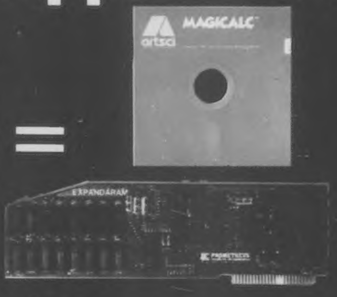

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Invisible columns for confidential data	YES	NO
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Full compatibility with VisiCalc	YES	YES
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CIRCLE 238 ON READER SERVICE CARD

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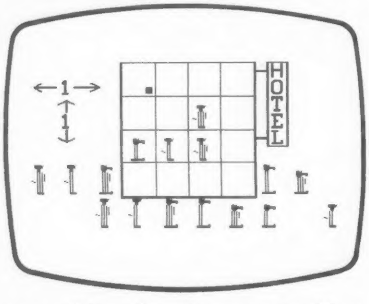
of the recreational software companies charge $5, seems a bit out of line. However, they probably know how educators tend to "borrow" things from one another so their price may well be justified.

Mop Town

The Apple Special Delivery series of educational programs is produced by the folks at Advanced Learning Technology, Inc. who are the same people who produce the high quality programs for The Learning Company. (*Magic Spells* is the other disk currently available through Apple. As the name implies, it deals with spelling skills.)

Mop Town covers a wide age range, according to the packaging: "4 to adult." Using a cast of 16 characters in 11 different games, *Mop Town* emphasizes logic and attributes. The four attributes are tall or short, fat or thin, red or blue, and bibbit or gribbit (bibbits have big noses and big feet, whereas gribbits have tails).

As is stated in the rules, "Moppits get along with each other very well because they all follow the rules that govern Mop Town. There are rules for just about everything that happens in Mop Town—what house a Moppit can live in, who can join a club; even who can be next to another Moppit in a parade."



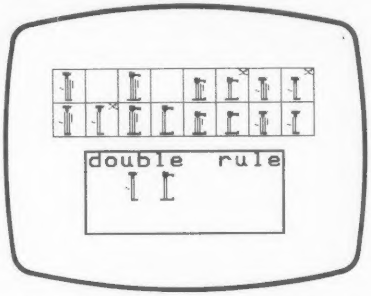
For example, in Game 3, "What's the Same?" we find four Moppits living in the same house. There is at least one thing that is the same about all the Moppits. After seeing the picture of them, you must choose which attribute they all have in common.

creative computing

SOFTWARE PROFILE

Name: Mop Town
Type: Educational game
System: 48K Apple
Format: Disk
Language: Machine
Summary: Learning logic attributes
Price: $50
Manufacturer:
Special Delivery Software
Apple Computer, Inc.
10260 Bandley Dr.
Cupertino, CA 95014

In Game 9, "Club House," we learn that "the Mop Town club house only lets Moppits join that fit the rule." The object of this game is to guess the membership rule. The rule could be a single trait rule (e.g., only tall Moppits) or a double trait rule (e.g. only tall and fat Moppits). You select Moppits that you think fit the rule. If they do, the Moppit will appear in the club house; if not, an "X" will mark the Moppit you chose. When you think you know the rule, you may type R (for guess rule). You will be shown a list of possible rules. Pick one and see if you are right.



The games are quite intriguing and lots of fun to play even if you are not trying to learn about logic attributes. But when you sneak into the computer room to play with the *Mop Town* disk that you got for your children, better turn off the sound or they will come running, too.

We very much like the policy of Apple Special Delivery Software which furnishes a back-up copy of each disk along with the initial package. This certainly overcomes the problem of making backup copies or determining a fair price for them.

Our applause to Leslie Grimm for another delightful learning game and to Apple for their excellent distribution and that "free" back-up disk.

Match Game

In the *Match Game,* the computer presents a gameboard of four to twenty numbered boxes. Players uncover two boxes on each turn, trying to find boxes with matching contents. To play well, you must remember what is hidden in each box as it is uncovered. The game can be played with either exact matches (the same word appears in two boxes) or paired matches (such as synonyms, translations from one language to another, or math problems and answers).

After power-up, you are asked whether you want to make your own game with exact matches, make your own game with paired matches, play a game you have saved on disk, or play one of the seven games furnished with the disk. These games include an exact match of computer words and paired matches of synonyms, French-English words, addition, subtraction, multiplication, and division problems.

Five board sizes ranging from four boxes (two matches) to the largest board with 20 boxes (10 matches) are available.

Up to four players (or three players and the computer) may play simultaneously. Of course, one player can play alone to see how long it takes to find all the matches. One player can also play against the computer.

During play of the game, the program tells whose turn it is. On each turn, you press RETURN to begin your turn, then type in the number of the first box followed by RETURN and the number of the second box followed by RETURN. If you find a match, those boxes are flashed on the board, and you get another turn.

At the end of the game, the score of each player is shown, and the winner (if there is one) is named. You then go back to a menu which allows you to play the same or a different game with the same or new players.

creative computing

SOFTWARE PROFILE

Name: Match Game
Type: Educational game
System: 48K Apple, 8K or 16K PET
Format: Disk or cassette
Language: Machine
Summary: Concentration revisited
Price: $29.95
Manufacturer:
Teaching Tools
P.O. Box 50065
Palo Alto, CA 94303

Match Game is suitable for use at home or in the classroom. According to the instruction booklet, "teachers have found it useful for putting current reading words, spelling words, topic words, or math facts in a game format."

We found the game held the interest of players of many ages. With larger boards (12 or more boxes), most players wanted to be able to write down the math problems; it was just too difficult to remember two- and three-digit numbers and match them to corresponding arithmetic problems. While this isn't exactly the idea of Concentration, we still felt that the *Match Game* was valuable because it provided the motivation to do the problems quickly and accurately.

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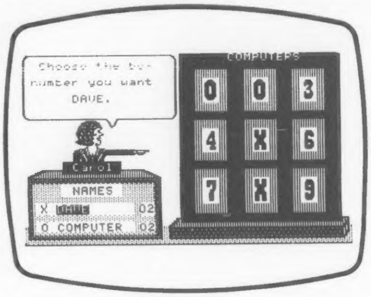
CIRCLE 305 ON READER SERVICE CARD

Learning Can Be Fun, continued...

Tic Tac Show

Tic Tac Show is an entertaining educational game which simulates a TV game show. The moderator sits at the left and talks to you out of a cartoon-style balloon. On the front of her desk is the score for the two players. To the right is a large tic tac toe game board with the numbers 1 to 9 on the playing positions.

Carol, the moderator, asks you to choose a number from 1 to 9. After you choose, a question is displayed. If you answer the question correctly, that block is filled in on the tic tac toe board in your color. Next, it is the turn of the other player (or the computer if you are playing alone). So, effectively this is a game of tic tac toe with the X's and O's being placed based on correct answers to various questions—reminiscent of the old TV game show *Tic Tac Dough.*



The disk containing the game program has 14 categories of questions such as computers, sports facts, French vocabulary, Mother Goose, skiing, and myths. Additional subject disks with nearly 600 questions on each retail for $19.95 apiece.

However, if you cannot find a subject that you like, the game disk contains its own authoring system which allows you to type in your questions and answers and save them on the disk. In this way, you can create an entirely new topic or topics. You can also add, edit, or delete questions from the existing series.

To add some spice to the game (after all, tic tac toe is a bit dull), the designers have included a "wildcard" function. When this comes up in the game, the current player gets an automatic pass (equivalent to a correct answer). In addition, in a tie game when the ninth square is about to be played, the moderator occasionally offers to toss a coin to decide which player gets it. More than once, I have lost this coin toss to the computer, and the computer is never wrong.

In summary, the concept, presentation and animation of *Tic Tac Show* are outstanding. The editing mode allows it to be adapted to a wide range of abilities, age groups and topics. We give it our top grade.

creative computing
SOFTWARE PROFILE

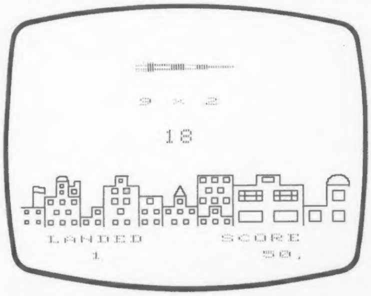
Name: Tic Tac Show
Type: Educational game
System: 48K Apple
Format: Disk
Language: Machine
Summary: New CAI variation
Price: $39.95
Manufacturer:
Computer Advanced Ideas
1442A Walnut St., Suite 341
Berkeley, CA 94709

Big Math Attack

Big Math Attack is a mathematics drill and practice program in the guise of a Missile Command type of game.

At the beginning you choose which of the four basic mathematics operations (addition, subtraction, multiplication, and division) you want and at which of two levels you wish to play.

A stylized city that is under attack appears near the bottom of the screen. The words "Landed" and "Score" are printed under the city. A rocket ship speeds across the top of the screen dropping an equation such as 4 + 2 or 6 x 9. You use the keyboard to enter the answer. Unfortunately, since the answer is being reproduced on the screen in high-resolution graphics, it takes quite a while to reproduce each numeral. Consequently, you may type 12 very quickly as the answer to a problem, only to find that the computer has accepted only the first numeral, 1. Although most players were able to adjust, we found some were more bothered by this time delay than others. The delay is especially annoying because speed is critical to the game score. The quicker an equation is destroyed, the more points are awarded. At first, the equations drop very slowly on the city. As more equations are solved correctly, the speed of their descent increases.



Unfortunately, there is no way to correct a typing mistake. Even if you have plenty of time before the equation lands on the city, once you make a mistake, you are stuck with it.

The game ends when five equations have landed (five missed problems) or when a maximum score of 5000 is reached.

The sound effects are interesting at first, but become old fast. For classroom use, it would be highly desirable to have a way to disable the sound effects, but none is included on the disk.

creative computing
SOFTWARE PROFILE

Name: Big Math Attack
Type: Educational game
System: 48K Apple
Format: Disk or cassette
Summary: Math drill and practice
Price: $25
Manufacturer:
T.H.E.S.I.S.
P.O. Box 147
Garden City, MI 48135
(313) 595-4722

Despite its shortcomings, *Big Math Attack* probably provides a higher level of motivation than other, more mundane drill and practice exercises. Two years ago, the execution would have been considered outstanding; today we expect more.

Multiploy

According to the instruction booklet, "*Multiploy* combines the excitement of an arcade game with the challenge of learning and practicing arithmetic skills." Well, yes and no.

To play the game, you use the keyboard to enter answers to problems that appear in four descending Problem Ships. A correct answer in your Answer Window causes a ray to be fired from the Answer Base which destroys one Prob-

creative computing
SOFTWARE PROFILE

Name: Multiploy
Type: Arithmetic game
Author: Paul Coletta
System: 48K Apple
Format: Disk
Language: Machine
Summary: Speedy drill
Price: $24.95
Manufacturer:
Reston Publishing Co.
Reston, VA 22090

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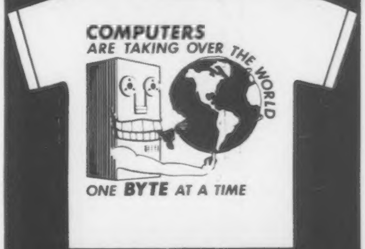
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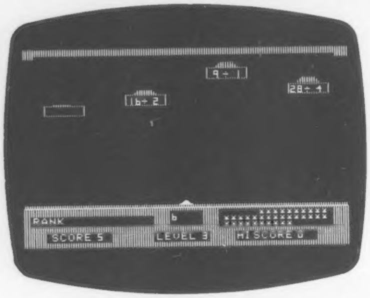
lem Ship. If you enter an incorrect answer, the Problem Ship(s) continue to drop, and the wrong answer disappears from the Answer Window.

To speed up play of the game on lower levels, the RETURN key may be pressed to clear the Answer Window of an incorrect answer or to fire a ray before the computer normally would.



If a Problem Ship is not destroyed by the time it descends about half way down the screen, an indicator starts to blink, warning you that the Problem Ship will soon begin to shoot back. You may continue to enter answers until the Problem Ship either makes a direct hit on the Answer Base or becomes a Missed Problem.

The game ends when all the Problem Ships have been eliminated or when a Problem Ship destroys your Answer Base. You are then given a rank based on the number of Problem Ships you eliminated.

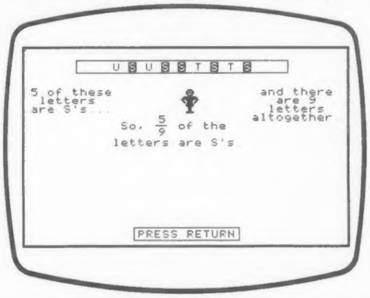
In playing *Multiploy*, you can choose an arithmetic operation (+,-,x,÷), level of difficulty (1 to 3), and regular or "lightning" speed. We found these options provided a suitable starting point for most youngsters in the target age range of 4 to 14. You might want to give that precocious kid multiplication problems at Level 3, lightning speed. Just for grins, I tried it and got a score of 8 (out of a possible 40) for a rank of Uniploy.

While *Multiploy* superficially resembles an arcade game with its four flying saucers and laser ray, it is actually drill and practice with a fancy timing mechanism. It held the interest of some of the youngsters who played it here although to a lesser extent than Broderbund's *Dueling Digits* (an equation building game in the arcade genre). Thus we suggest that *Multiploy*, like most educational games, be used with adult supervision and encouragement.

Fractions —Basic Concepts

The *Fractions—Basic Concepts* disk is one of a series of eight learning packages in the Arithmetic Classroom series from Sterling Swift Publishing. Each one is packaged in a 7" x 9" three-ring binder which contains brief instructions for loading and using the disk, two sets of practice exercises, five copies of a student achievement record, and an answer key for the practice exercises.

The Arithmetic Classroom series is virtually identical to Swift's Elementary Mathematics Learning series except that it does not include the learning management system which contains mastery tests, diagnostic/prescriptive functions and an achievement record keeping system for up to 200 students. The Arithmetic Classroom is available on eight individual tutorial disks for $49.95 each. A three-game disk for reinforcement costs $29.95. The EMCL system with the learning management disks costs considerably more. Thus, the Arithmetic Classroom disks, despite their name, seem most suitable for home use, although schools might want to get individual units.



5 of these letters are S's...

and there are 9 letters altogether

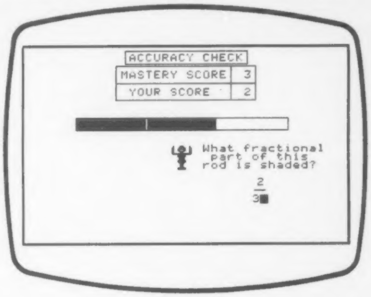
So, $\frac{5}{9}$ of the letters are S's.

The *Fractions—Basic Concepts* package is typical of the other eight. There are five lessons on the disk, each of which starts out with a tutorial. You are led through this tutorial by a cute androgynous (of indeterminate sex) cartoon character. The tutorial is a combination of text and graphics, although no color or sound is used.

creative computing
SOFTWARE PROFILE

Name: Fractions—Basic Concepts
Type: Educational tutorial
Authors: Fawzy Tibrahim,
David N. McClintock and
Patricia M. Mullinix
System: 48K Apple
Format: Disk
Summary: Comprehensive learning system
Price: $49.95
Manufacturer:
Sterling Swift Publishing Company
1600 Fortview Rd.
Austin, TX 78704

Following the tutorial, six related problems are presented for you to answer. After each answer, your friendly electronic tutor (shall we call him/her Terry?) gives you reinforcement by dancing a jig, juggling his head, or shooting an arrow which is actually your name. If you miss a problem, Terry is not content merely to flash the correct answer; rather he reviews the procedure for obtaining it.



ACCURACY CHECK	
MASTERY SCORE	3
YOUR SCORE	2

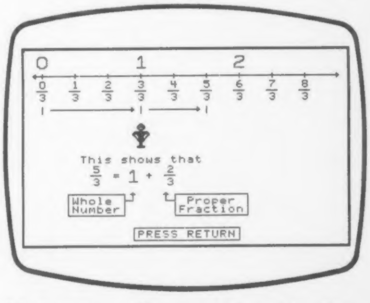
What fractional part of this rod is shaded?

$\frac{2}{3}$

After the six problems, Terry shows your score and asks if you would like to review the concept further or go on to the next lesson. If you have completed several skills, before going on to the next one, Terry gives you a short mastery test of all of the previous ones. Again, corrective feedback is provided if you stumble on any of the problems.

The five student achievement record sheets (which may be copied) provided in the manual are a good place for keeping track of the progress of different members of the family or students in the classroom.

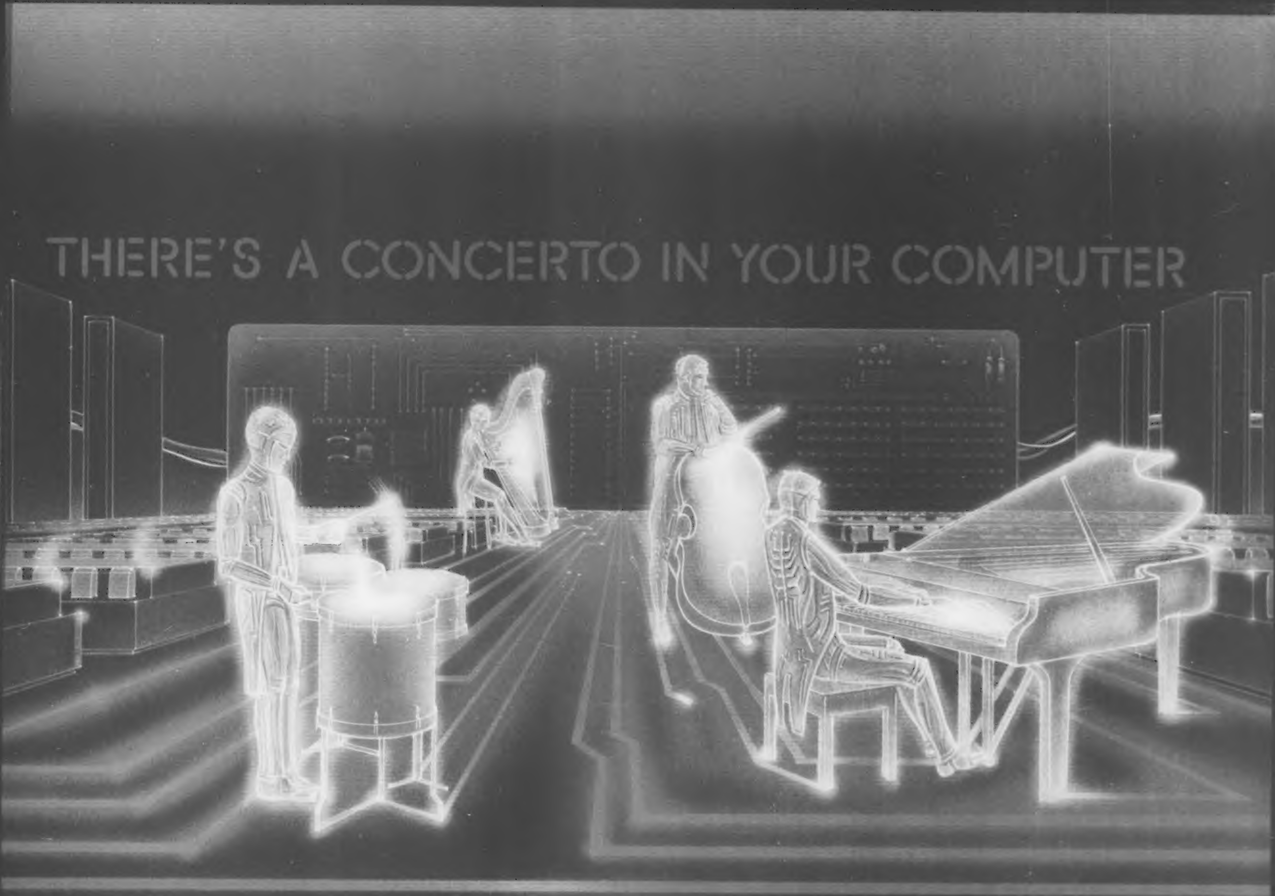
In our previous review, we were enthusiastic about the Swift Elementary Mathematics Classroom Learning System. We are equally enthusiastic about the Arithmetic Classroom. We like the objective-based tutorial approach, the drill and practice exercises which rarely repeat, the excellent feedback in the event of an error, and the positive reinforcement for correct responses.



This shows that

$\frac{5}{3} = 1 + \frac{2}{3}$

Our only negative observation is that Sterling Swift does not have a policy for obtaining back-up disks. They charge $9.95 for a replacement of the original disk. This seems a bit steep to us.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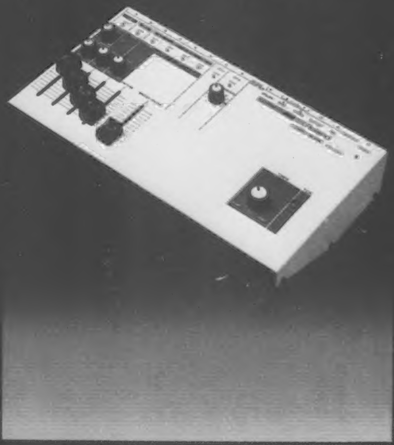

...And a waltz, a blues song, a rhapsody, and a whole lotta rock n roll. In fact, your computer can now play any kind of music, thanks to the new Roland Compu-Music.

Roland, the world's leading producer of synthesizers and electronic musical instruments, has put its years of music programming experience into a high performance computer/music synthesizer system that can easily be used by anyone—from the computer user with a musical background to the programmer with a song in his heart.

The Roland Compu-Music does for music what the word processor has done for words. The Compu-Music software allows your computer to write, program, change and store musical compositions of up to eight voices, plus a seven voice electronic drummer. The Compu-Music hardware (CMU-800) is a music synthesizer that plays these musical parts.

The CMU-800 connects to your computer through any auxiliary slot and then connecting to any amplifier or stereo system for performance. Because the Compu-Music system is software based, it allows for virtually infinite hardware expansion. It can never become obsolete.

Playing and programming the Compu-Music is so easy that you don't have to be a musician, but if you are, you'll appreciate the well-thought-out programming, a system that Roland has used for many years with proven success. Also, the CMU-800 hardware easily interfaces with many other synthesizers for expanded performance—all controlled by your computer.

The Roland CMU-800 Synthesizer retails for $495.00. The Compu-Music Software retails for $70.00 and is available for the Apple II and NEC computers. For more information, see your computer dealer or contact RolandCorp US, 2401 Saybrook Avenue, Los Angeles, CA 90040 (213) 685-5141.

CIRCLE 259 ON READER SERVICE CARD

Roland

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Edu-Ware Fractions

The *Edu-Ware Fractions* disk contains four major components: a learning manager system which allows an adult (parent or teacher) to tailor the presentation of the instructional materials, a pre-test which measures the learner's knowledge and skills before entering any of the learning modules, six learning units each designed to teach a different skill used in fraction computations, and a post-test which assesses the learner's new skills after completing the units.

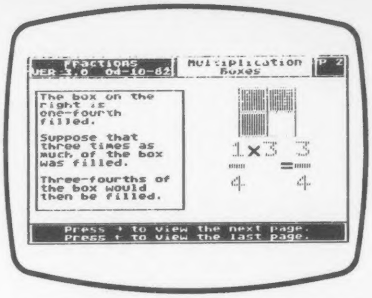
The six learning units cover definitions and parts of the fraction, denominators, and fraction arithmetic (addition, subtraction, multiplication, and division).

Each learning unit consists of ten pages (screens) of instructional material. Pages are all done in high-resolution graphics and use upper and lower case letters, diagrams, and animation where appropriate. Some of the pages are definitions and demonstrations, while others require the user to fill in one or more blanks or complete a problem. These frames lead the user step-by-step through each part of the learning experience.

For example, one of the more difficult conceptual skills for learners to master is that of equality. Hence, the unit on denominators introduces examples of fractional manipulation and gives the learner considerable practice. Skills introduced are: changing denominators, finding the common denominator by using prime factors, reducing denominators, and finding the lowest common denominator. Once the user has mastered these skills, he will have a much easier time with the units on addition, subtraction, multiplication and division of fractions.

creative computing
SOFTWARE PROFILE

Name: Edu-Ware Fractions
Type: Tutorial
Author: Sherwin Steffin, et al.
System: 48K Apple
Format: Disk
Summary: Fraction tutorial
Price: $49
Manufacturer:
Edu-Ware Services, Inc.
P.O. Box 22222
Agoura, CA 91301



```
   Fractions        | Multiplication   | P 2
VER 3.0  04-10-82   |     Boxes        |

The box on the
right is
one-fourth
filled.

Suppose that
three times as
much of the box
was filled.

Three-fourths of
the box would
then be filled.

                         1×3   3
                         --- = -
                          4    4

     Press → to view the next page.
     Press ← to view the last page.
```

The user can move from any page in a learning module to either the next page or

Scrambling Words

Within the past year, many manufacturers have brought word scramble programs to the market. In this comparative review, we'll take a look at three such programs. Before rushing out to buy one of these, you may want to consider just what educational value they have. Scrambled word exercises are not in wide use in school curricula. The computer makes it easy to mix up the letters of a word, present it, and accept guesses for the unscrambled word. But does that help the student spell the word or recognize it in context? Simply because something *can* be done does not automatically mean it *should* be done. But if you think scrambled word exercises are worthwhile, read on.

All three programs have certain elements in common. All have two main parts. The first part presents the scrambled words, and then requires the user to type the unscrambled words. A second part of each package is an editor which allows a teacher or parent to enter lists of words, change words on existing lists, display lists of words and the like.

Magic Spells by Leslie Grimm of Advanced Learning Technology is distributed by Apple Computer's Special Delivery Software Division. Of the three programs, this is the closest to a game. The disk opens with a high resolution graphic welcoming you to Spells Valley. You journey from there to the Kingdom of Spells where you meet the Wizard of Spells, who has twelve lists of twenty words each to be unscrambled. You can select any one of the lists.

The instructions tell us, "There are twenty chests of gold and jewels hidden throughout the castle. Each one may be opened if you know the right spell.

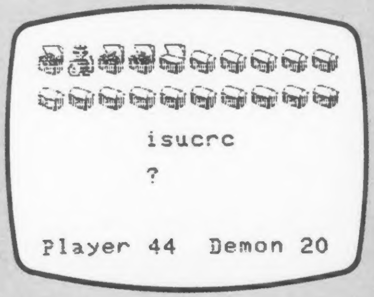
"A word of warning . . . you are not alone in the Castle of Spells. The spelling demon will be close behind, waiting to take some of your treasure should you fail to give the correct spell."

At the beginning of the game, you are shown a screen with ten unscrambled words on it. If you wish, you can write these words down on a piece of paper. Pressing RETURN displays the second half of the list. The word lists that come with the disk are also found in the appendix to the manual.

The unscrambling process then begins. Twenty closed treasure chests are pictured at the top of the screen. A scrambled word is shown in the center of the screen. You type your guess for the word below it. If your guess is correct, the first treasure chest pops open and you are awarded a number of points corresponding to the number of letters in the word.

creative computing
SOFTWARE PROFILE

Name: Magic Spells
Type: Educational game
Author: Leslie M. Grimm
System: 48K Apple
Format: Disk
Summary: Unscramble words
Price: $45
Manufacturer:
Special Delivery Software
10260 Bandley Dr.
Cupertino, CA 95014



```
        isucrc

        ?

Player 44   Demon 20
```

If you spell the word incorrectly, a clue appears below the scrambled word. The clue shows the letters you placed in the correct position and question marks in the other positions. This clue remains on the screen as you try to guess the word again. You can try for the word as often as you wish. When you get it, the treasure chest is replaced by the demon, indicating the word was spelled without help but in more than one try. You and the demon divide the points for that word.

If you just can't guess the word at all,

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urs, ther." e sys- good

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the preceding one by pressing the right or left arrow key respectively.

For those who prefer to get directly into using the learning modules, the learning manager system is not required. However, the use of it allows a great deal of flexibility in tailoring the learning experience to an individual user. For example, the instructional material can be presented in a sequence which you preselect, you can let the pre-test select the learning sequence, or let the learner choose his own learning sequence. You can change the number of incorrect responses the learner is allowed for a practice problem before the system will take him back to review material. You can add or delete units to be tested in the pre-test or post-test, change the number of problems, view pre-test or post-test scores, and so on.

The 14-page instruction manual describes the use of the disk in detail, discusses the learning manager system and options, and describes the instructional model (assumptions, objectives, sequencing, classroom utilization) of the package.

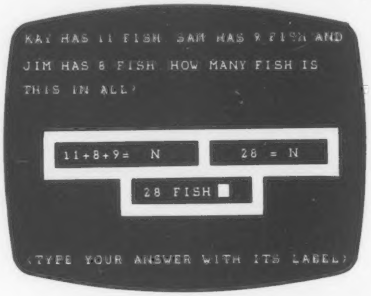
Edu-Ware Fractions is one of a series of programs from Edu-Ware Services, all of which we have found to be of excellent quality. We also applaud Edu-Ware for their policy providing low cost ($5.00) updates of their packages when new ones are released.

Read And Solve Math Problems

Read and Solve Math Problems is called in the manufacturer literature, "a progressive tutorial and drill program that teaches the important elements of word problems and conversion of written problems to number problems. The program allows interaction between the student and the computer, provides reinforcement of all concepts, and reteaching where necessary. The program is self-scoring and will not allow the student to progress to higher level concepts until the previous lesson has been mastered."

There are ten lessons, five on each disk. The first two lessons focus on finding the key words in addition and subtraction problems. The student is given a series of problem statements in which he must identify words such as "altogether, in all, total, fewer, and smaller."

The lessons then progress to writing



```
KAY HAS 11 FISH. SAM HAS 9 FISH AND
JIM HAS 8 FISH. HOW MANY FISH IS
THIS IN ALL?

11+8+9=  N          28 = N

         28 FISH ▮

(TYPE YOUR ANSWER WITH ITS LABEL)
```

---

you can type an * and the unscrambled word will replace the scrambled one. However, in this case you get an empty treasure chest and the demon takes all of the points for that word.

At the end of the game, your final score is displayed until you go back to the main menu.

The editor portion of the disk called Spells Writer has five options:

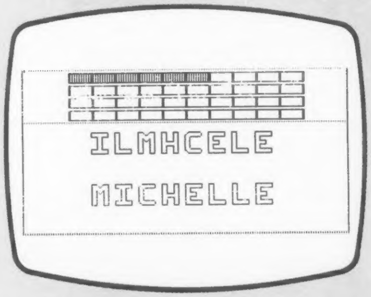
1. Enter a new list of words
2. Delete an old list of words
3. View a list of words
4. See list of file names
5. Copy list on printer

There are also options to make back-up copies of the disk, replace back-up copies, and make word list disks. Each of these editing functions is fully described in the comprehensive 25-page manual. Words may consist of upper and lower case letters, apostrophes, hyphens, and periods. The left arrow may be used to correct a spelling mistake both while entering words with Spells Writer and while playing the game.

The only problem we experienced with the disk is that it is not tolerant of rapid typing when you are playing the game. This is because each letter is shown on the high resolution screen and it takes time for the computer to draw the letter and get ready to accept the next one. Error trapping is excellent, and pressing RESET in the middle of the game is the only way to hang up the program that we found. The package comes with both a master and a back-up disk and is an all-around professional job.

Scramble by Ahead Designs is similar in concept to *Magic Spells* but not in execution.

Upon loading the disk, the user is directed to "Enter your name." The screen then displays the 20 words in word file A. These are displayed one at a time; pressing RETURN brings up the next word. This is a rather time consuming procedure compared to displaying the list in two groups of ten words each.



```
ILMHCELE

MICHELLE
```

After the list of unscrambled words has been displayed, the game starts. As in *Magic Spells*, the screen is divided into three parts. The top part has a grid of 40 rectangles (4 x 10), each one being worth five points. The center part of the screen displays the scrambled word. If you spell it correctly on the first try, two rectangles in the grid are filled in for a score of ten points. If you spell it incorrectly, there is no clue given. Instead, the scrambled word is rescrambled and shown again. In many cases, this second scrambling is helpful in that it shows different letter combinations and may point the user to the correct word.

You have two tries to spell the word correctly. If you spell it correctly on the second try, your score increases by five points. A misspelled word on the second try causes "incorrect" to appear at the bottom of the screen and the word is automatically presented correctly spelled. A new scrambled word then appears.

If your score reaches 180 or higher, "Super Speller" is displayed. Upon entering the last word, you almost immediately get the message, "Game Over," and the screen is erased in preparation for a new user who is directed to "enter your name."

We found that some users were disappointed that their score disappeared so quickly and could then be viewed only by entering the Teacher Utility

creative computing
SOFTWARE PROFILE

Name: Scramble
Type: Educational game
Author: Sandy Head
System: 48K Apple
Format: Disk
Summary: Unscramble words
Price: $15.95
Manufacturer:
Ahead Designs
699 North Vulcan
Encinitas, CA 92024
(619) 436-4071

creative computing
SOFTWARE PROFILE

Name: Read And Solve Math Problems
Type: Tutorial
Authors: Anne Edson and Allan Schwartz
System: Apple, Pet, or TRS-80
Format: Cassette or disk
Language: Machine
Summary: Learn to solve word problems
Price: 5 cassettes $78, 2 disks $85
Manufacturer:
Educational Activities Inc.
P.O. Box 392
Freeport, NY 11520
(516) 223-4666

equations and using them to solve addition and subtraction problems. Since the package is geared to grades 4 to 6, the equations are relatively simple and consist of problems such as

$$31 + 18 = n$$

The second disk goes on to multiplication and division problems along with more addition and subtraction problems, although no problems combine more than one numeric operator.

After a basic concept is explained, a typical screen presents a problem in the top two or three lines. For example, "there were 72 people at the rides. Each car at the rides could hold 8 people. How many cars were needed?"

The student is then asked to type in the left side of the equation, in this case, "72/8." He is next asked for the variable, which is always n, and is told to solve for n. Finally he is asked to type in his answer with its label, in this case "9 cars." After each correct answer, the word "great," "correct," or "right" appears on the screen in a cute graphic form accompanied by some beeps and boops. After all the problems in one lesson have been completed, a final score is given by means of another cute animated graphic presentation.

Included with the package are ten reproducible activity masters to reinforce the concepts presented and four masters for use as pre- and post-test.

Read and Solve Math Problems is a good solid tutorial and drill package and should find favorable acceptance in the classroom.

Golf Classic and Compubar

Golf Classic provides practice in estimating angles and lengths. When the program is loaded, a bird's eye view of one hole on a golf course appears on the screen. The ball is shown on the tee. Your object is to "hit" the ball into the hole on the green with the fewest possible strokes. When it is your turn, the program asks, "What angle would you like to use?" You enter an angle between

---

menu. Calling this menu is also the only way to change the starting word list.

The Teacher Utility also allows default parameters to be changed, a word file to be copied, edited, or displayed and the list of student scores to be displayed. The grade book records the scores of up to 30 students. The scores are not saved on the disk so they are lost, of course, if the computer is turned off or RESET is pressed.

The disk is not copy protected so it may be copied on a blank disk for regular use while the master disk is kept in a safe place.

The Avant-Garde disk, *Word Scrambler & Super Speller* includes a spelling practice program in addition to the word scrambler program which some users may find desirable.

The first time we loaded the disk we were a bit put off. The opening title on the disk takes an interminably long time to appear, and the prompts and instructions for using the disk are somewhat cryptic. There is no instruction manual or sheet with the package, and after it was loaded we pressed RESET at an inopportune moment causing the disk to self-destruct. Perhaps Avant-Garde has deemed a copy protection scheme of this type necessary, but we think that most users will find it undesirable.

We were more careful with the replacement and had no further trouble.

Unlike the other scramble programs, this one does not show the word list in advance. Instead, if you select the scramble option, you are asked for the amount of time you wish to allow to decipher a word and which of the three word lists you wish to use. There are lists for students in Grades 0-3 (words with two to four letters), Grades 4-8 (four to eight letters) and "experts" (five to fourteen letters).

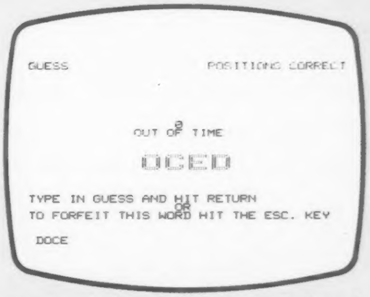
The scrambled letters of a word appear on the screen along with a counter indicating the seconds remaining to guess the word. We found this made some users very nervous, and caused them to "clutch" as in a timed exam.

When you type in a guess, the program indicates the number of letters that are in the correct positions, but not which ones they are. You get three guesses to get the word, and you receive one point if you get it without a hint and one-half point if you need a hint.

One feature to which we object in this program is that a correctly spelled word is considered wrong if it is not the one the program is seeking. For example, the scrambled letters SINP appeared. We entered SNIP and were told "That's not it. Try again." Okay, we put in PINS. Wrong again. Last try, NIPS. Wrong again. The word the program was looking for? SPIN.

creative computing
SOFTWARE PROFILE

Name: Word Scrambler & Super Speller
Type: Educational game
System: 48K Apple
Format: Disk
Language: Machine
Summary: Unscramble words
Price: $19.95
Manufacturer:
Avant-Garde Creations
P.O. Box 30160
Eugene, OR 97403
(503) 345-3043



```
GUESS                    POSITIONS CORRECT

              0
          OUT OF TIME

             OCED

TYPE IN GUESS AND HIT RETURN
                   OR
TO FORFEIT THIS WORD HIT THE ESC. KEY

 DOCE
```

In the spelling practice mode of operation, a word is quickly flashed on the screen, and you must type it in. As with the word scrambler, you get three tries to get it. Incidentally, flash card presentations are alternated with scrambled words if you select the scramble option.

Like the other programs, this one allows you to enter your own lists of practice spelling words.

All in all, we felt that *Word Scrambler & Super Speller* was the least user-friendly of the three packages. However, it offers the additional flash card spelling practice mode that the others do not and thus may better meet your needs.

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Schedule C
Schedule D
Schedule E
Schedule F
Schedule G
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Schedule W
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1040 SE

2106
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- 1040 page 1 & 2
- Schedule A
- Schedule B
- Schedule C
- Schedule D
- Schedule E
- Schedule F
- Schedule G
- Schedule R/RP
- Schedule W
- 1040 ES
- 1040 SE
- 2106
- 2119
- 2210
- 2440
- 2441
- 3468
- 3903
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CIRCLE 172 ON READER SERVICE CARD

0 and 360 degrees and press the RETURN key. You may enter negative angles if you wish.

A diagram in the lower right corner of the screen shows a circle with four angular directions marked on it, 0, 90, 180, and 270 degrees. Pressing H puts a grid over your ball to assist you further.

After you have entered the angle you wish, the computer asks, "How many units long?" A line one unit long is shown in the lower corner of the screen The unit length is different each time you play a round. You may enter your unit length using decimals as well as whole numbers.

Once you land on the green, the computer putts for you and tells you how many putts you took. Of course, the closer you land to the hole, the fewer putts the computer has to take for you.

There is a one-stroke penalty for going out of bounds or into a water hazard. When you are shooting from a sand trap, your ball may go at a slightly different angle or distance than you chose.

The game may be played by one to four players. A reusable scorecard, which may be marked with a wax crayon or water-soluble marker, is included with the software package.

Compubar, according to the package, "provides practice in reading graphs, constructing arithmetic expressions, and mental addition and subtraction."

At the start of the game, five blue bars between one and fifteen units long are displayed in the top two-thirds of the screen. At the bottom of the screen, a green bar is displayed, also between one and fifteen units in length. A horizontal (x) axis with unit markers and labels at 0, 5, 10, and 15 is shown in the center of the screen between the blue bars and the green bar.

Your objective is to combine three or more bars, from the blue graph to form a bar the same length as the green goal bar shown below. You may use each blue bar only once.

creative computing
SOFTWARE PROFILE
Name: Golf Classic and Compubar
Type: Educational game
Author: William Kraus
System: 16K Atari 400 or 800 (cassette), 32K Atari 800 (disk)
Format: Disk or cassette
Language: Machine
Summary: Learn to estimate angles and length
Price: $29.95 (cassette), $32.95 (disk)
Manufacturer:
EduFun! Division
Milliken Publishing Co.
1100 Research Blvd.
St. Louis, MO 63132

You press + to add a bar, – to subtract a bar, and S to stop when you have completed your answer. If the red bar you have made is the same length as the green goal bar, you win. Perfect scores earn a display of fireworks when you stop.

We found in playing *Compubar* that, in general, the answer must be completely thought out before starting to add and subtract bars. For example, in one problem we had blue bars that were 11, 9, 5, 3, and 2 units in length. Our goal was to construct a bar 15 units in length. Only one solution is possible (11 + 2 - 3 + 5 = 15). Trial and error was not likely to yield this solution, particularly since you are not permitted to make a bar less than 0 nor more than 15 units long at any time.

A reusable *Compubar* card on which you may use a crayon or marker to shade in bars and try to combine them is provided. We found however, that most users preferred to form an algebraic expression and simply add and subtract numbers rather than manipulating bars. On the other hand, the algebraic approach probably provides practice in skills that are at least as valuable as manipulating the bars.

We would have preferred that the program not return to the initial title after completing an exercise but instead provide the opportunity for another student or group of students to play the same game. We feel this approach is particularly desirable on the Atari computer given its rather long load times. Nevertheless, the package is well done and representative of the high quality programs in the Milliken EduFun! series.

Word Families

Word Families contains three different categories of material: beginning consonants, ending consonants, and medial vowels.

Upon loading the disk, you are asked to enter your name. You are then given a choice of nine groups of words, three in each of the three categories mentioned above. The word list is loaded and shuffled and then presented, one word at a time, at the top of the screen.

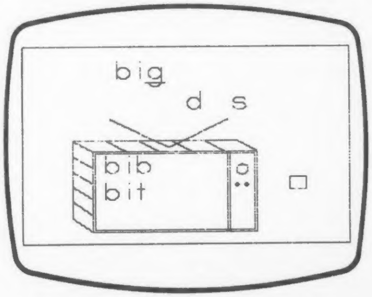
A word appears with one letter underlined. Below it are four additional letters. From this group you select the letters that will make a complete word when substituted for the underlined letter. If your selection is correct, the letter disappears from the list and the new word appears on the stylized TV screen at the bottom of the screen. If your selection is incorrect, the response is recorded on the student file, but the screen does not change. After finding all of the words within a group, an X shows in a small box at the right of the screen. This signals the user to press RETURN to bring on the next presentation.

creative computing
SOFTWARE PROFILE
Name: Word Families
Type: Educational drill
Author: Robert Hartley
System: 48K Apple
Format: Disk
Language: Machine
Summary: Learn families of words
Price: $29.95
Manufacturer:
Hartley Courseware Inc.
P.O. Box 431
Dimondale, MI 48821
(616) 942-8987

For example, in beginning consonants, the word *like* is presented with the l underlined. Four letters are shown: s, h, d, and b. In this instance, all the letters except s will form a word when substituted for the l.

After every ten correct responses a clown's face appears on the screen.

Lessons vary from 22 to 39 words long. After a lesson has been completed the number correct out of the total number of attempts will be shown. Pressing the ESCAPE key exits the program at any point and displays your results to that point. Results are automatically stored in the "student planning" file.

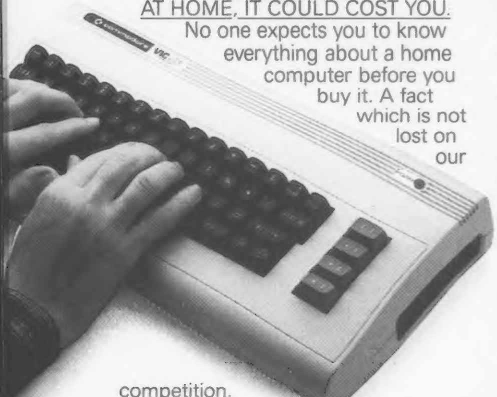


The student planning file holds records for up to 100 students.

A second part of the disk allows a teacher or parent to delete, add, and examine words in the different lists. The student planning file allows a teacher or parent to examine previous scores, clear the file, or print student records on a printer.

Error trapping is excellent and short of pressing the RESET key, we found nothing that would abort or destroy the program.

HOME IS THE LAST PLACE YOU SHOULD LEARN ABOUT A HOME COMPUTER.



WANT TO LEARN SOMETHING ABOUT HOME COMPUTERS? HERE, IT'S FREE. AT HOME, IT COULD COST YOU.

No one expects you to know everything about a home computer before you buy it. A fact which is not lost on our competition.

They know that an impressively low price can divert your attention from some depressingly cheap features. So that you won't know what you may be missing with their home computer until after it's been in your home for a while.

At which point, naturally, it'll cost you to change your mind.

IT'S EASY TO TELL THE DIFFERENCE.

Fortunately, you don't have to be a computer engineer to tell what makes the Commodore VIC 20™ superior to the competition. All you have to do is take advantage of three of your five senses.

Use your sense of vision and read this comparison chart. You can see in black and white where two of our major competitors have skimped. Use your sense of touch in the store. You'll feel the VIC 20's superiority immediately. It feels a lot more expensive than it is.

If these two senses don't convince you that the VIC 20 offers more for the money than any other home computer, simply rely on common sense.

COMPUTER FEATURES	VIC 20	TI 99/4A	ATARI 400
Typewriter Keys	Yes	Yes	No
Typewriter Feel	Yes	No	No
Color Control Keys	Yes	No	No
Graphics on Keys	Yes	No	No
Reverse Letters	Yes	No	Yes
Programmable Function Keys	Yes	No	No
Works with TV or Monitor	Yes	Yes	No
True Lower Case Letters	Yes	No	Yes
DISK FEATURES			
Capacity	170K	90K	88K

NOW THAT YOU KNOW HOW EASY A COMMODORE HOME COMPUTER IS TO OWN, FIND OUT HOW EASY IT IS TO EXPAND.

One thing about home computers that you're bound to discover at home is that, once you learn what they can do, you'll want them to do more and more. To do this, you may need accessories called peripherals. These let you get more out of a home computer by letting you put more into it.

They include items like cassette recorders and disk drives to input data, modems for telecomputing and printers. And all VIC 20 peripherals are fully compatible with the powerful Commodore 64™ personal computer.

PLAN AHEAD.

When you start looking at your first home computer, you may think it's too early to start planning to add peripherals. If that's what you think, you're once again playing right into the hands of our competitors.

Because once they've gotten you to buy their home computer, for what seems to be a reasonable price, they have you hooked on their system.

The costs of which, if you'll examine the chart below, can really start getting unreasonable. For example, while these computers may seem to be close to the same price to start, an expanded system can cost you twice as much with TI or Atari as with the Commodore VIC 20 or Commodore 64.

EXPANSION COSTS	VIC 20™ or COMMODORE 64™	TI99/4A®	ATARI 400®
BASIC	Included	Included	$59.95
Peripheral Expansion System	Not Necessary	$249.95	Not Necessary
Disk Drive	$399.00	399.95	599.95
Disk Controller Card	Included	249.95	Included
Modem	109.95	224.95	199.95
Modem Interface	Included	174.95	219.95
TOTAL	$508.95	$1299.75	$1079.80

Manufacturer's suggested list prices: Prices per TI June-December 1982 U.S. Consumer Products Suggested Price List.
Atari prices effective July 1, 1982 Suggested Retail Price List.

THINK OF IT AS BUYING A TOASTER.

It's easy to fill up a computer ad with RAM's and ROM's, numbers and technical jargon. But when it comes right down to it, buying a home computer is just like buying anything else. It's important to know just what you're getting for your hard-earned money.

And we hope we've accomplished that here by telling you about the cost of expanding your Commodore VIC 20 or Commodore 64 computer.

commodore COMPUTER

U.S.A.—P.O. Box 500, Conshohocken, PA 19428; Canada—3370 Pharmacy Ave., Agincourt, Ontario, Canada M1W2K4.

CIRCLE 130 ON READER SERVICE CARD

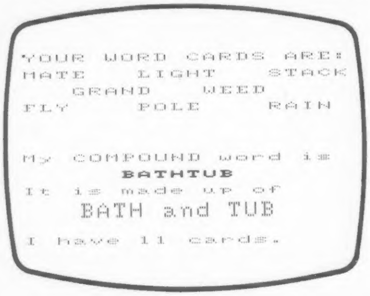
Word Mate

Word Mate is a game played against the computer in which you produce compound words from shorter words. The object of the game is to help you recognize closed compound words.

At the beginning of the game, you are dealt ten word cards. You try to match two of the word cards to make a compound word. For example, if your word cards are:

rain nest coat good

you would enter *raincoat* as a compound word. Nest and good would remain in your hand. The computer plays against you. You can type one compound word on each turn. If you cannot match two words, you press the RETURN key. The computer then tells you how many cards it has in its hand. You type the number of the word card you want from the computer hand. You and the computer take turns until one of you finally wins. Beware, the computer does not make mistakes. Each compound word the computer produces is shown on the screen along with the two smaller words from which it was made.



```
YOUR WORD CARDS ARE:
MATE       LIGHT       STACK
     GRAND       WEED
FLY        POLE        RAIN


My COMPOUND word is
          BATHTUB
It is made up of
     BATH and TUB

I have 11 cards.
```

The disk comes with ten word lists of ten compound words each. If you wish, you can enter new words or entire word lists. You can view the new words you have loaded into a word file, but unfortunately, you cannot view the 100 words that are already on the disk.

Word Mate is menu-driven and uses colorful, high-resolution graphics to display all of the instructions and words in upper and lower case. The program is well designed and has good error trapping routines. Recommended for grades 3 to 6.

creative computing
SOFTWARE PROFILE
Name: Word Mate
Type: Educational game
System: 48K Apple
Format: Disk
Language: Machine
Summary: Learn compound words
Price: $25
Manufacturer:
T.H.E.S.I.S.
P.O. Box 147
Garden City, MI 48135
(313) 595-4722

Pal Reading Curiculum

PAL (Personal Aid to Learning) is a unique diagnostic and tutorial system that goes well beyond the standard drill and practice approach of so many other programs. The *Pal* system covers reading education for grades two through six.

The *Pal* system consists of two parts, a master disk package and curriculum packages. The master system contains a disk with a mini operating system for the *Pal* curriculum disks. It also includes an upper/lower case chip for your Apple in case you do not already have one installed. This allows the lesson material to be presented in a "real world" format without having to use the high-resolution screen. The booklet provides complete instructions for installing the chip.

Upon loading the system, *Pal* asks if you know what objective you wish to start with. The 32 objectives covered by the Reading-Level 6 curriculum package are listed on Pages 9-11 in the manual. However, if you are not sure where you want to start, *Pal* will suggest a starting point. If you have not used the system before, *Pal* will start at the beginning, appropriately enough. If you have used the system and recorded your previous results, *Pal* will pick up where you left off.

Initially, *Pal* instructs you to load a Discovery Disk. This is an evaluator. It has five questions on each of the 32 objectives. You can elect to take the entire 160-question test or just selected objectives. At the end, *Pal* will give you your score and indicate the areas, if any, with which you had difficulty. There are three discovery disks; *Pal* gives you explicit instructions as to when to use each one.

The Learning Disks contain the lessons and exercises to correct the difficulties found on the Discovery Disks. Instruction typically starts out with five or six screens of tutorial material. Each screen contains a modest amount of information, in upper and lower case, of course, with highlighting for the key points. You can study this for as long as you wish, and then press the space bar to proceed. Fast readers will be a bit frustrated at the slowness with which the information appears on the screen; this is because of the extensive amount of disk accessing. However, for the most part, the speed is appropriate for the target grade levels.

After the tutorial screens, several questions are presented. If you miss any of these questions, or if you missed a question on the discovery disk, *Pal* will show you exactly what you missed, explain why your answer was incorrect, and show you the correct answer. This approach is far superior to systems that simply tell you what you missed or just show the correct answer.

creative computing
SOFTWARE PROFILE
Name: Pal Reading Curriculum
Type: Tutorial
Authors: Dale Foreman,
Stanley Crane,
and Daniel Myers.
System: 48K Apple
Format: Disk
Summary: Great graphics and action
Price: Master $99.95
Manufacturer:
Universal Systems
for Education, Inc.
2120 Academy Circle, Suite E
Colorado Springs, CO 80909

Pal uses a mastered, tried and not tried method of scoring, rather than a raw score. The system can produce three reports: a student report gives the progress of an individual student, a class report lists all students and shows their progress toward a selected goal, and a grouping report groups students into three categories (mastered, needs more work, not tried) on a selected objective. These reports can be printed as well as viewed on the screen. A *Pal* master disk can keep the records for up to 30 students.

In summary, *Pal* is an outstanding remedial/tutorial system with a friendly, personalized approach that is nonthreatening to the poor reader. It is validated against the most widely used textbooks and should be of interest to parents for use at home as well as to teachers for classroom use.

Vocabulary Baseball

Vocabulary Baseball is a multiple choice quiz about vocabulary words in the guise of a baseball game.

At the start of the game you are given a choice of three games: a short (one-inning) game consisting of three outs (or three incorrect answers), a two-inning game which allows six incorrect answers, or a three-inning game which allows nine outs.

When the game starts, the upper two-thirds of the screen is occupied by a stylized baseball diamond. An abbreviated

Great Plains Accounting/Management Software

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Most business people know that there are two ways to improve business profits: sell more or spend less. The Hardisk Accounting Series from Great Plains Software does both. And your profits will never be better!

Great Plains Software improves business profits because it accounts for them. Your profit centers are isolated and unnecessary losses are avoided – whether you're using General Ledger, Accounts Payable, Accounts Receivable, Payroll or Inventory with Point-of-Sale.

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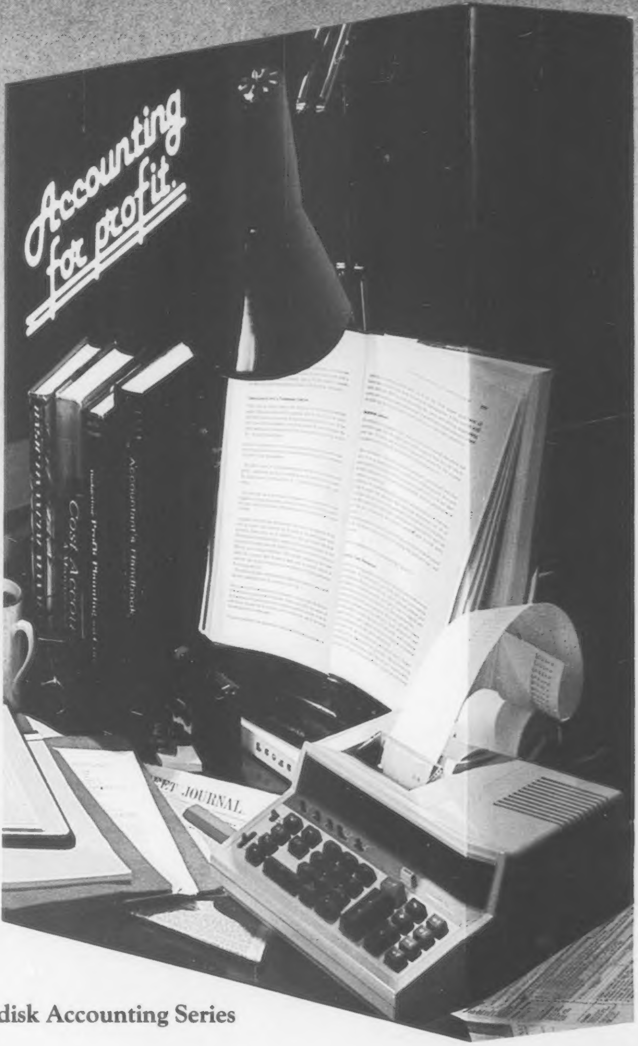
Call or write your local computer store dealer or Great Plains Software for more information on how you can account for your profits!



Hardisk Accounting Series

SPECIFICATIONS

OVERALL
Password Privacy System
Written in UCSD Pascal**
Hard Disk Oriented
Operates on Apple III, IBM PC

GENERAL LEDGER
All entries on line entire fiscal year
Flexibly formatted financial statements
Comparative income statements and balance sheets

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Profit by customer, customer type, salesman and state
Open item or balance forward
Automatically posts to G/L

ACCOUNTS PAYABLE
Up to 32,768 vendors*
Accommodates manual or generated checks
Automatically posts to G/L

PAYROLL
Up to 32,768 employees*
Up to 25 deductions per employee
Withholding computed
Prints W2, 941 and checks

INVENTORY
FIFO, LIFO, standard cost, weighted moving average and serial number valuation
5 price levels per part
Concise report including profit by part and line
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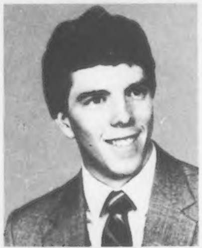
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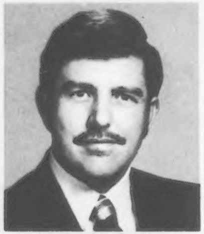
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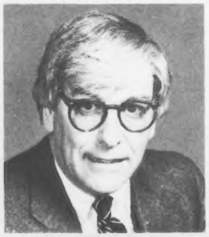
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Vocabulary Baseball Word Lists.

Single	**Double**	**Triple**
Meditate	Minatory	Susurrant
Assimilate	Replication	Apse
Apparent	Turgid	Rachitic
Berate	Incursion	Pullulate
Abscond	Effulgent	Denouement
Discrete	Anhydrous	Cajolery
Mandatory	Expatiate	Eclectic

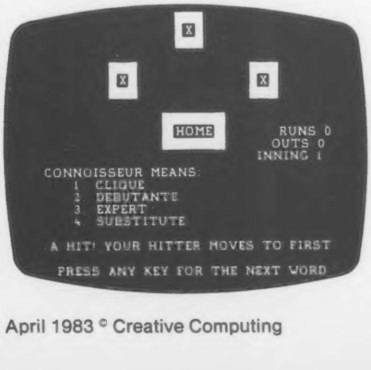
scoreboard which indicates the number of runs, hits, and outs appears on the right.

As each player comes to bat, he can try for a single, double, or triple. He is awarded a hit if he correctly defines the word presented. An attempt for a single base hit results in an easier word, while a player trying for a triple must guess the meaning of a much more difficult word. Table 1 shows seven words that we found in each category. We felt that many of the words in the triple group were extremely difficult and not likely to be known by any but the most dedicated of lexicologists. For example, *susurrant* is not even in Webster's New Collegiate dictionary. Furthermore, the definition for *apse* required by the program is recess, which is a secondary meaning again not listed in Webster's.

The definition for replication required by the program also calls for the second meaning of the word (echo). For the meaning of eclectic, which would you choose, selecting or comprehensive? I chose the latter but the program was looking for the former. Playing a triples only game, three innings, on average I scored between 12 and 20 correct before getting nine outs—and words are my business!

When the player completes the program, if his score is higher than that of the present record holder, his name and total are recorded on the disk as the score to beat. According to the instructions, "this competitive aspect of the game encourages students to try it again and again. In this process they improve their vocabulary."

The instruction sheet with the disk describes how to eliminate names and scores and start over with a clean slate. It also describes how to list the existing words and change them or their definitions.



```
                              RUNS 0
                              OUTS 0
                            INNING 1
CONNOISSEUR MEANS:
     1. CLIQUE
     2. DEBUTANTE
     3. EXPERT
     4. SUBSTITUTE

A HIT! YOUR HITTER MOVES TO FIRST

  PRESS ANY KEY FOR THE NEXT WORD
```

To restart the disk after a play of the game, RUN must be typed, and the program starts over from the beginning. A better way would be to ask, at the end of the program, whether another student was waiting to play or if the current student wanted to play again. This would save having to reload the start-up graphic, re-enter the student name, and reload the word file.

Although there are nearly 1000 words on the disk, the random number generator appears to cause the program to start at a similar point in the list each time it is run. While this gives students a head start on subsequent plays of the game, (assuming they learned the definitions from the previous game) it does not expose them to as many new words as one might expect. Nevertheless, we judged *Vocabulary Baseball* an effective vocabulary builder, although it is unlikely that many students will come to know and use the words in the triple category.

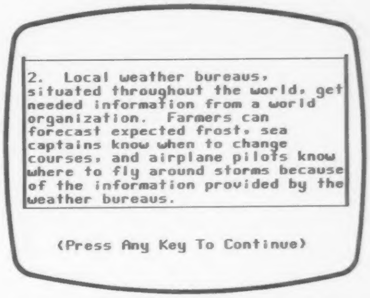
creative computing
SOFTWARE PROFILE
Name: Vocabulary Baseball
Type: Educational game
System: 48K Apple
Format: Disk
Language: Machine
Summary: Game to improve your vocabulary
Price: $29.50
Manufacturer:
J & S Software
140 Reid Ave.
Port Washington, NY 11050

How To Read In The Content Areas

How To Read In The Content Areas is one in a series of software packages from Educational Activities to help students read with understanding.

The literature tells us that the program package is designed to help students master the following concepts: "spotlighting for vocabulary building and learning the meaning of new words and concepts; surveying to determine the information given in a particular reading; detecting main ideas and inferences; recalling important facts, ideas, and details; and utilizing and applying skills to content areas." This description reminded us of jargon we have read in educational grant proposals.

What the program boils down to is a presentation of five or six paragraphs of information followed by questions about them. On each disk, are four programs each of which presents five to eight screens of text on a particular subject. Large upper and lower case letters are displayed on the high-resolution screen, so this is not as much text as it might sound. Following the presentation of the text, the student is presented with seven questions (multiple choice, true/false, fill in the blank and find a word) which he must answer. If a question is answered incorrectly, the screen of information from which the answer can be derived is shown again, and the question repeated.



```
2.  Local weather bureaus,
situated throughout the world, get
needed information from a world
organization.  Farmers can
forecast expected frost, sea
captains know when to change
courses, and airplane pilots know
where to fly around storms because
of the information provided by the
weather bureaus.

     (Press Any Key To Continue)
```

Although the manufacturer's literature tells us "through the clever use of graphics, the microcomputer rewards successful student performances with vi-

creative computing
SOFTWARE PROFILE
Name: How To Read In The Content Areas
Type: Tutorial
Author: E. Insel and A.N. Rabin
System: 48K Apple
Format: Disk
Language: Machine
Summary: Reading skills development
Price: $49
Manufacturer:
Educational Activities Inc.
P.O. Box 392
Freeport, NY 11520

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Fruitful Connections.

There are more people in more places making more accessories and peripherals for Apples than for any other personal computer in the world.

Thanks to those people — in hundreds of independent companies — you can make the humblest 1978 Apple II turn tricks that are still on IBM's Wish List for 1984.

But now we're coming out with our very own line of peripherals and accessories for Apple® Personal Computers.

For two very good reasons.

First, compatibility. We've created a totally kluge-free family of products designed to take full advantage of all the advantages built into every Apple.

Second, service and support.

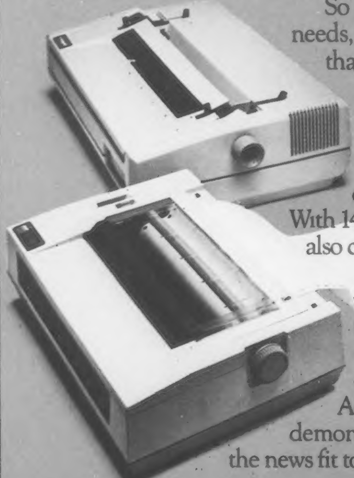
Now the same kindly dealer who keeps your Apple PC in the pink can do the same competent job for your Apple hard-disk and your Apple daisywheel printer.

So if you're looking to expand the capabilities of your Apple II or III, remember:

Now you can add Apples to Apples.

Gutenberg would be proud.

Old Faithful Silentype® has now been joined by New Faithfuls, the Apple Dot Matrix Printer and the Apple Letter Quality Printer.



So now, whatever your budget and your needs, you can hook your Apple to a printer that's specifically designed to take advantage of all the features built into your Apple. With no compromises.

The 7x9 Apple Dot Matrix Printer is redefining "correspondence quality" with exceptional legibility. With 144x160 dots per square inch, it can also create high resolution graphics.

The Apple Letter Quality Printer, which gets the words out about 33% faster than other daisywheel printers in its price range, also offers graphics capabilities. See your authorized Apple dealer for more information and demonstrations. Because, unfortunately, all the news fit to print simply doesn't fit.

A joy to behold.

The new Apple Joystick II is the ultimate hand control device for the Apple II.

Why is it such a joy to use?

With two firing buttons, it's the first ambidextrous joystick — just as comfortable for lefties as righties.

Of course, it gives you 360° cursor control (not just 8-way like some game-oriented devices) and full X/Y coordinate control.

And the Joystick II contains high-quality components and switches tested to over 1,000,000 life cycles.

Which makes it a thing of beauty. And a joystick forever.

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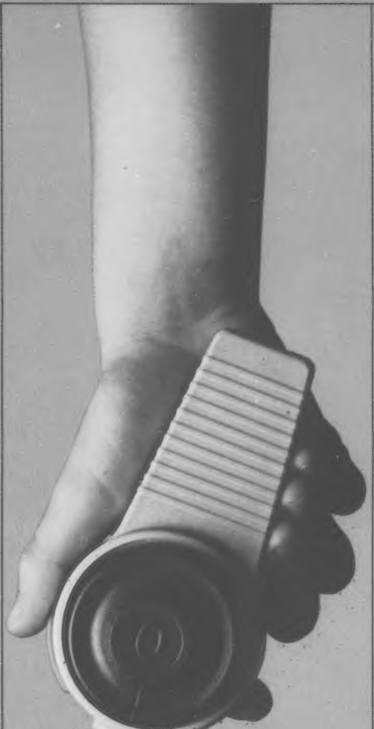


Up the creek without a paddle?

Or lost in space? Or down in the dungeons?

Whatever your games, you'll be happy to know that someone has finally come out with game paddles built to hold up under blistering fire. Without giving you blisters.

Apple Hand Controller II game paddles were designed with one recent discovery in mind:

People playing games get excited and can squeeze very, very hard.

So we made the cases extra rugged. We used switches tested to 3,000,000 life cycles. We shaped them for holding hands and placed the firing button on the right rear side for maximum comfort.

So you'll never miss a shot.

A storehouse of knowledge.

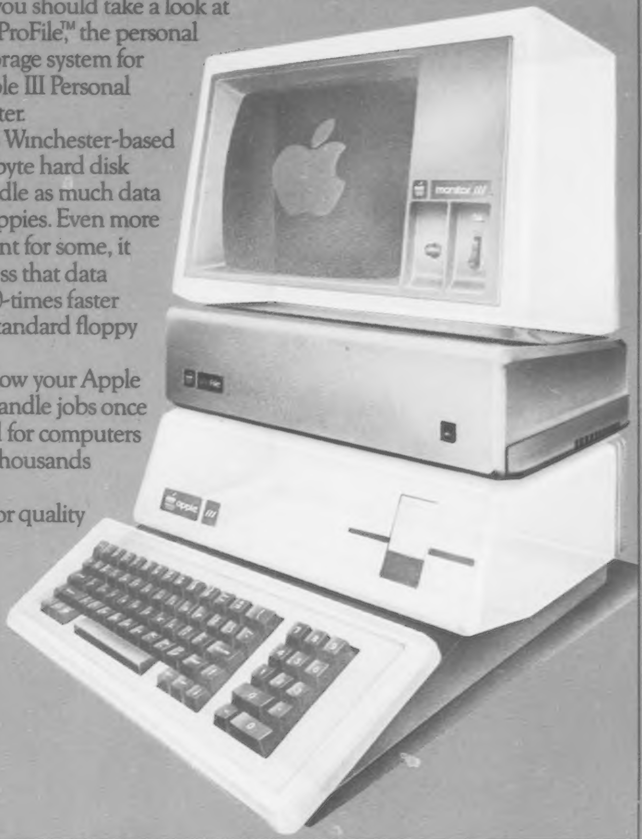
If you work with so much data or so many programs that you find yourself shuffling diskettes constantly, you should take a look at Apple's ProFile,™ the personal mass storage system for the Apple III Personal Computer.

This Winchester-based 5-megabyte hard disk can handle as much data as 35 floppies. Even more important for some, it can access that data about 10-times faster than a standard floppy drive.

So now your Apple III can handle jobs once reserved for computers costing thousands more.

As for quality and reliability, you need only store one word of wisdom:

Apple.



Launching pad for numeric data.

Good tidings for crunchers of numerous numbers:

Apple now offers a numeric keypad that's electronically and aesthetically compatible with the Apple II Personal Computer. So you can enter numeric data faster than ever before.

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CIRCLE 107 ON READER SERVICE CARD

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sual prizes," the visual prize turns out to be a word such as "nice," "great," or "super" in large type on the screen. However, users did not seem to object to this nearly as much as they did to the delays in responsiveness of the software when typing in word answers. The reason for the delay is that the letters are displayed in the high-resolution mode, and it takes the computer a while to draw each one on the screen. However, even fifth and sixth graders (the target age range of the programs) were able to hunt and peck faster than the software was able to accept their answers.

On the bright side, each disk in the *How To Read In The Content Areas* series comes with five reproducible activity sheets which contain key words from the text in interestingly shaped word search puzzles. The brief instruction sheet includes a description of how to use the program and answers for the word search puzzles.

Profile of a Snooper Trooper

This year was 1978. The month was January. The meeting was set for the following Tuesday at the home offices of one of the largest game makers in the world. Tom Snyder, now the president of Tom Snyder Productions (formerly Computer Learning Connection) in Cambridge had an appointment with a key executive at Parker Bros.—the head of game acquisitions.

Tom recalls, "I had looked forward to the meeting for months, constantly redesigning my game called Personk, a wood-wire-string contraption that was a simplified model of a computer. I had put an enormous amount of my own time and money into the project."

When the fateful Tuesday finally arrived, Tom discovered that all along the meeting had been set for the previous Monday. "It only took me a few moments to realize that I had subconsciously decided to miss the meeting. I wasn't ready to leave the known, comfortable world of teaching to enter the competitive, intense world of business."

That startling moment of insight, however, ended up being a turning point in Tom Snyder's life. "I went back to the drawing board filled with a compulsive burst of creative energy. By the end of the week I had purchased a microcomputer and taught myself to program. Next, I transformed the three-dimensional game of Personk into a piece of microcomputer software for kids."

Snyder followed Personk with a series of educational simulations for his students at Shady Hill School covering such subjects as archeology, community, energy, geography, and geology. He and his venture capitalist partner, Jere Dykema, soon sold these programs, called "The Search Series," to McGraw-Hill. By then the fledgling entrepreneur was ready for the business world "and that time I did not miss the meeting."

Today, Tom Snyder is 32 years old, recently remarried, and the owner of an endearing old mutt name Roqueforte. He continues to teach at the same private school in Cambridge "out of a sense of loyalty to the school and a love of kids."

He scored a notable success in late 1982 when his *Snooper Troops I and II* became the first educational gameware for home and school computers to make the industry's bestseller list. These games, as well as the upcoming *The Most Amazing Thing...*, were published, marketed, and distributed by Spinnaker Software Corporation of Cambridge, MA.

While Tom variously describes himself as a design addict, programmer, songwriter, advocate for children and technology, teacher, author, and entrepreneur, he also possesses a well-deserved reputation as an avant-garde thinker in the home and educational software field. He is wary of the drill-and-practice approach to educational software. The material Tom designs reflects his belief that a classroom should be a "learning environment," a place where group dynamics and proficiency in basic reading and writing skills are more important than using a computer.

He states, "The computer is there as a servant or a tool. My goal as a teacher isn't to have the kids become CRT nerds. I prefer to have students take an active role with the computer by making them responsible for keeping track of information and having them work together in small groups. To teach a set of skills, the software must encourage kids to manipulate numbers and facts and make decisions."

Recently, Tom and several colleagues authored a book entitled *Computers in the Classroom.* His contribution was a series of vignettes "all of which have a dour sound to them because I am still very skeptical about the use of computers in classrooms."

Tom Snyder, however, has no skepticism about his own company and its products. "We want people to know that we are trying always to write the highest quality, most entertaining software possible. We're fascinated with the technology, always looking for excuses to design, and the thing that keeps us honest is our attachment to kids."

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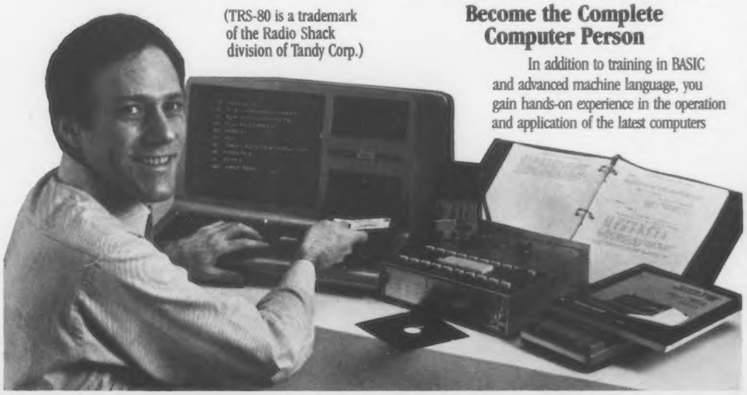
(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)



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We'll give you tomorrow.

While the approach of this package is certainly pedagogically sound, we question whether it is worth $49 to replace about 20 to 30 pages in a textbook. Undoubtedly, the computer provides a level of motivation that the textbook does not. This suggests that these packages may be most useful for remedial work or for students who have difficulty keeping their attention focused on a book.

Snooper Troops

Snooper Troops is a series of adventure detective games which help children learn to take notes, draw maps, classify and organize information, and develop vocabulary and reasoning skills. Children, did we say? Yes, but only if they can shoulder the adults out of the way.

In Case #1, "The Granite Point Ghost," we read in the instructions, "Someone is trying to scare the Kim family right out of their new home. But who? And why?

"As a Snooper Trooper, your job is to find out. But it will take some daring detective work. You'll have to question witnesses, uncover background information, and even search dark houses to find the facts.

"The computer program provides you with all the equipment you'll need: a SnoopMobile, a wrist radio, the SnoopNet computer, a camera for taking Snoop Shots and a notebook for keeping track of the information you uncover as you get closer to solving the mystery.

"Granite Point Ghost offers children the challenge and excitement of solving a mystery and features full color graphics and sound."

We joined the case on Tuesday in week 1. We were given Snoop license number . 5 and connected with the SnoopNet computer.

It told us that "Mister X will accept a call at 357-7359 on Wednesday afternoon." We were then allowed to look up people facts, special messages, or old clue files. We were also allowed to make an accusation (it was a bit soon for that!) or leave the office.

We elected to leave, hopped in the SnoopMobile and paid a visit to a nearby house. We stopped at 9 Larch Street, went to the door of the house, and asked the person who answered, "Where were you the evening of April 6?" The person replied, "Are you sure you have the right place?" (this was listed as clue 896). Since we could not satisfactorily answer the question, the door was slammed in our face.

We then went around to the right side of the house and entered through an open basement window to take some Snoop Shots.

Thus started our adventure to find out who was trying to scare the Kim family out of their home and why.

Although this is billed as an educational adventure for children, we found it was quite challenging and not something that could easily be solved in 10 or 15 minutes—ten or fifteen hours might be more like it. We found it considerably easier to play with two people, since some of the clues appear on the screen for a very short period of time, and it is difficult to find the right page in the Snooper Troop Notebook to write down the clue while it is still visible. Single players may find it desirable to keep a tape recorder nearby to record telephone numbers, dates, and the like which can be copied into the notebook and analyzed later on.

The program can be stored on the disk when you want to rest and resumed from that point the next time you attempt to solve the mystery.

All in all, we feel the *Snooper Troop* games are exceptionally well done, highly motivational, and valuable in helping users learn to take notes and analyze relevant information. The packaging and instruction booklets are outstanding; we give Spinnaker an A+ for these packages.

creative computing

SOFTWARE PROFILE

Name: Snooper Troops

Type: Educational adventure game

System: 48K Apple or Atari 800, disk drive

Author: Tom Snyder

Format: Disk

Language: Basic

Summary: Adventures go educational

Price: $44.95

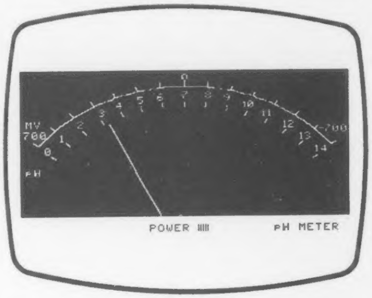
Manufacturer:

Spinnaker Software
215 First St.
Cambridge, MA 02142

Fundamental Skills for General Chemistry

About ten years ago when I was Education Product Line Manager at Digital Equipment Corporation, we were seeking high quality educational materials in different subject areas. One of our customers, Paul Cauchon at the Canterbury School in Milford, CT, showed us course notes and proposed that we compile them into a book. Thus was born the book, "Tutorial Exercises For Chemistry," one of the first of its kind. Paul's latest book, "Chemistry With A Computer," updated and in its third printing, contains 28 programs, fully documented with sample runs, complete listings and suggestions for classroom use. The cost is $14.95 from Programs For Learning, Inc.

However, Paul didn't stop there, but went on to gather a group of educators in the field of chemistry dedicated to the development of computer-based instructional materials. Marketed by Programs For Learning, the packages fall into two general categories: drill and practice exercises and simulations.



The *Fundamental Skills for General Chemistry* package which we reviewed contains 12 drill and practice exercises along with a 32-page three-ring instructor's guide. The drills are presented in high-resolution graphics so that upper and lower case letters, symbols, subscripts and superscripts are all displayed "correctly." When a problem is answered correctly, a brief reinforcement message such as "very good" appears, and the next problem is presented. Should a problem be missed, a discussion of how to arrive at the correct answer is presented on the screen. This is far better than simply presenting the correct answer and going on.

The exercises are not graded in a group. It is up to the teacher to decide what an appropriate "passing" level is. The instructor's guide suggests mini-

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SOFTWARE PROFILE

Name: Fundamental Skills for General Chemistry

Type: Drill and practice

Authors: Paul Cauchon, et al.

System: Apple, Pet or TRS-80

Format: Cassette or disk

Summary: Drill in chemistry

Price: $150

Manufacturer:

Programs For Learning, Inc.
P.O. Box 954
New Milford, CT 06776
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CIRCLE 117 ON READER SERVICE CARD

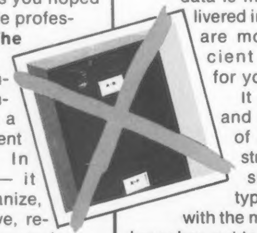
The reason you bought a computer in the first place.

The General Manager

The Agony... You expected your new computer to perform miracles — to bring order out of chaos. You looked for it to organize and manage your business information. You looked forward to the end of errors, the end of frustration . . . and the saving of time, effort and money. Afterall, that's the reason you invested in a computer in the first place. Yet, there it sits. Nothing.

...and the ecstasy.

Well, your computer *can* perform all the miracles you hoped for. It needs just one professional addition. **The General Manager.**



The General Manager is what the computer industry calls a data base management program (DBM). In everyday words — it allows you to organize, store, file, find, save, retreive, interrelate, control and print out all or selected parts of your information. The result: your information, or data, is managed totally, completely, automatically.

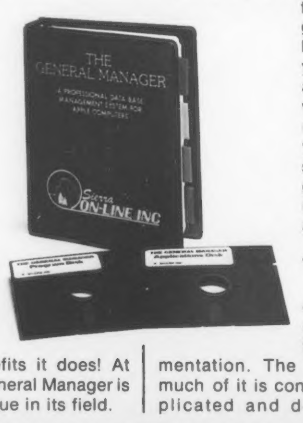
Ordinary

The ordinary DBM system expects your business to conform to its program design. So you must change your records, your forms, your way of having information cross-referenced, saved and . . . well, you almost end up with a different business! Certainly a more frustrating one.

Extraordinary

The General Manager on the other hand is extraordinary in the DBM field, because it makes no such demands on you. Instead, it lets you make demands on it! The General Manager was designed so that your business routines can be kept as individualized as you want . . . so your data is managed and delivered in the ways which are most useful, efficient and effective for you.

It works so easily and so well because of its "hierarchial" structure. This sensible "family tree" type of design starts with the main subject, then branches out to related information. You enter data on "Blank Forms" which you may construct to your exact needs. The data may be updated, deleted or modified to your heart's content. To know The General Manager will be to love it!



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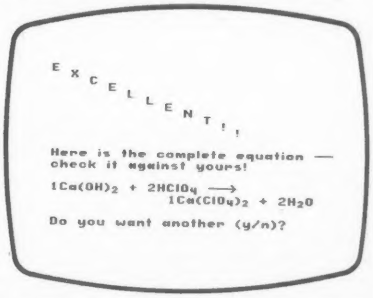
*The General Manager, version 2.0 requires 48K Apple II or II+, 1 or more drives, DOS 3.3. Direct orders add $3.00 shipping/handling.

CIRCLE 253 ON READER SERVICE CARD

mum competency levels; for example, in the drill on balancing equations it suggests continuing until five equations in a row are balanced correctly. On the other hand, for the drill on chemical nomenclature, which requires the student to name simple chemical compounds and write chemical formulas, the guide suggests continuing until 20 questions in a row are answered correctly.

The 12 programs cover topics such as balancing equations; density, mass and volume problems; symbols, atomic numbers and electron configurations of the first 20 elements; exponential notation; symbols and charges for common ions; computing formula weights; and names and symbols of elements.

We also tried some simulation programs from the *Acid-Base Chemistry* and *Basic Electricity* packages. The simulation programs demonstrate various principles or processes by letting the user see "what will happen if" certain steps are taken or particular conditions established.



```
E X C E L L E N T ! !

Here is the complete equation —
check it against yours!

1Ca(OH)2 + 2HClO4 —→
             1Ca(ClO4)2 + 2H2O

Do you want another (y/n)?
```

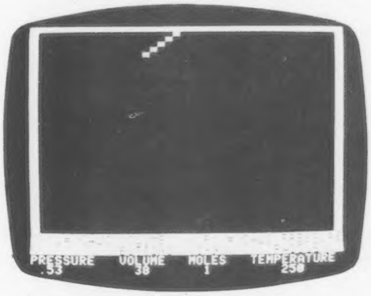
Such programs are very useful in preparing for laboratory experiments and possibly even for replacing an experiment which cannot easily be performed in the lab. Having been away from a chemistry lab for more than 20 years, I probably should not have tried to analyze an unknown acid sample in the most efficient manner, since I barely remembered the word *titration* much less how to do a titration analysis. Nevertheless I had good fun even though the computer charged me 20 cents each time I had to refill the buret. I wound up taking about seven times as long to complete the experiment as the computer estimated it ought to have taken.

All in all these programs are very well done and should be welcomed by chemistry instructors at the high school and beginning college levels.

Chem Lab Simulations

Four *Chem Lab Simulations* have been developed by J. Gelder, a chemistry professor at Oklahoma State University. Although developed for the college level, the material in simulations 1 (titrations) and 2 (ideal gas law) are probably suitable for a high school level also. Simulations 3 and 4 covering calorimetry and thermodynamics are probably best left for college level students. All except simulation 2 are available for the Atari as well as the Apple. However, because the second simulation makes the most effective use of graphics, we chose to review it here.

Chem Lab 2 is designed to illustrate the ideal gas law, the kinetic-molecular theory, and the principles of diffusion. In the first part, the ideal gas law, $PV = nRT$, is illustrated. The ideal gas is represented on the screen as colorful (orange) particles bouncing and colliding with each other in space. The color of the particles, background, and piston may be changed if you desire. As the pressure, volume, temperature, or number of gas moles is varied by the user, the effect on the other three parameters and on the behavior of the gas is shown immediately. Temperature is varied with the potentiometer on paddle 1, the number of moles is varied using the numeric keys 1-9, and volume and pressure are varied with the paddle buttons. The bottom of the screen displays in numeric terms, the pressure, volume, moles, and temperature. Of course, an increase in temperature is also shown on the main part of the screen as the particles move faster and collide more frequently. This also occurs as a result of decreasing the volume, which increases the pressure. This is shown on the screen display in the form of a large piston on the right which compresses the amount of free gas space.



The comprehensive 32-page manual contains 14 exercises on the ideal gas laws including Boyle's Law and Charles's Law, three exercises on kinetic-molecular theory, six exercises on the mixing of two ideal gases, and four exercises on the expansion of an ideal gas.

The programs are well written and have good error trapping routines. Incorrect input is ignored although you may be scolded for not entering data that you should have noted. Since there are upper and lower limits to the acceptable range of pressure, volume, moles, and temperature, the results are likely to be realistic and similar to those that would be achieved with laboratory apparatus. The big difference is that you can't blow up the lab with this disk.

creative computing
SOFTWARE PROFILE

Name: Chem Lab Simulations
Type: Educational simulation
Author: J. I. Gelder
System: 48K Apple, paddles,
32K Atari 800
Format: Disk
Summary: Great graphics and action
Price: $100
Manufacturer:
High Technology Software
P.O. Box 14665
Oklahoma City, OK 73113
(405) 840-9900

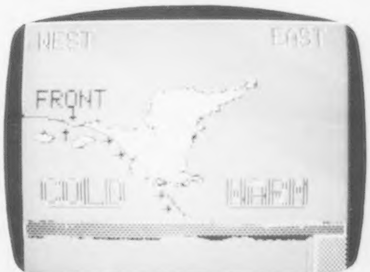
Weather Fronts

Weather Fronts is one in a series of "lesson-tutorgraphs" from TYC (Teach Yourself By Computer) Software. The disk is accompanied by a six-page booklet which explains the contents of the disk, suggests classroom uses, and lists the 24 tutorial and 10 test questions (with answers) that are contained on the disk.

Upon loading the disk you are presented with three options: tutorial, test, or review.

The tutorial section offers a programmed learning presentation of the material covered by the lesson. As the program proceeds, you are quizzed on your understanding of the material presented. In general, two questions are displayed after each screen of text or graphic material.

If you answer a question incorrectly, the program branches to an alternate display of the same material. You are then given another question covering the



same topic but phrased differently. If you again answer incorrectly, the text and question are repeated using the original wording.

All questions are multiple choice. Upon giving a correct answer, you always receive the same message of "Congratulations (your name). Press space bar to go on."

The graphic illustrations of weather fronts are excellent and make good use of animation and pointers. Since they use color extensively, we recommend a color monitor or TV set for this package.

creative computing
SOFTWARE PROFILE
Name: Weather Fronts
Type: Educational tutorial
Author: Patrick C. Moyer
System: 48K Apple
Format: Disk
Language: Machine
Summary: Learning about the weather
Price: $24.95
Manufacturer:
TYC Software
40 Stuyvesant Manor
Geneseo, NY 14454

The test is graded and you may use it as a pre-test, post-test, or both. After completing the test, you receive a percentage grade. In addition, you are informed of the screens of text and illustrations that would be most appropriate for review based on your test results. For example, based on my score of 80%, I was told I might want to review screens 4, 5, 10, and 11 and figures 4 and 5.

Text and illustrations may be reviewed using the third option on the disk. This allows you to access randomly any screen of text or illustration from the tutorial.

I have been away from programmed instruction since doing my Ph.D. work at Pitt in 1968. However, it hasn't changed much in 15 years. It is boring but reliable. After all, if the Army can train helicopter pilots using programmed instruction with a requirement that 100% of the graduates attain 100% mastery of the material, you get some idea of its efficacy.

In *Weather Fronts,* Moyer has taken the well-proven programmed instruction approach, put it on the Apple computer, and added some nice, colorful graphics. It takes about 20 to 30 minutes to complete the disk. There is no doubt that upon so doing you will know the structure, characteristics, and weather associated with cold, warm, occluded, and stationary fronts.

Tell Star

Tell Star is an astronomy program which shows the location of stars and planets for any location on earth during the late 20th century. The program displays a portion of the sky 90 degrees wide facing in any of eight directions, N, NW, W, SW, etc. or directly overhead. The display is very accurate, generally within 15 seconds of arc. To achieve this accuracy, the program takes into account factors such as the precession of the earth in a somewhat lengthy five-minute calculation.

Pressing C causes the constellations in your field of view to be drawn. The program can also locate any star or planet (at least those listed in the tables with the program) by means of a blinking cross hair. Pressing any key displays information about the object such as magnitude, right ascension, declination, rising time, and setting time. You can also move the cross hair manually with the game paddles or joystick and obtain information about any stellar object on the display.

A calculation program is included on the *Tell Star* disk to convert equatorial coordinates to horizontal and vice versa, and to convert ecliptic to equatorial. It is also possible to calculate the location of objects in the solar system without going to the display portion of the program.

The program is available in two versions: standard and advanced. The advanced version has two sets of star tables plus an additional table containing stars and stellar objects for the southern hemisphere. The Level I tables list about 180 stars and 13 Messier objects; the Level II tables have fewer stars but nearly 90 Messier objects.

An extensive 48-page tutorial manual is included in the package. An appendix has the star tables mentioned above. *Tell Star* is an excellent program for the serious student of astronomy as well as for amateur and professional astronomers.

creative computing
SOFTWARE PROFILE
Name: Tell Star
Type: Educational tutorial
System: 48K Apple
Format: Disk
Language: Machine
Summary: Predict star and planet locations
Price: $39.95 and $79.95
Manufacturer:
Information Unlimited Software
281 Arlington Ave.
Berkeley, CA 94707
(415) 525-9452

Understand Yourself

Remember the Creative Computing disk, *Know Yourself,* with five self-analysis programs? Well, Huntington has gone Creative one better, or should we say four better? This disk contains nine comprehensive tests to help you better understand yourself. They test assertiveness, conscience, manipulation, marital adjustment, personal adjustment, preferred activities, sexual attitudes, and your individual scale of values, and end with a personal equation test.

Each test includes between 10 and 100 multiple choice questions. Before and after each group of questions is some general discussion which presents, in very general terms, some background information on, for example, assertiveness or conscience. While the disk refers to the series of questions as tests, they might more properly be called profile, opinion, or attitude questions.

You do not pass or fail tests of this sort. Rather they give you an idea of how your profile compares with some norm or statistical sample. If you are honest while answering the questions, and there is no reason not to be, you may well gain some valuable insight into your attitudes, values, and psyche.

creative computing
SOFTWARE PROFILE
Name: Understand Yourself
Type: Psychological self-analysis
Author: Harry Gunn and Mike Taylor
System: 48K Apple
Format: Disk
Language: Machine
Summary: Lots of questions
Price: $24.99
Manufacturer:
Huntington Computing
P.O. Box 1297
Corcoran, CA 93212

And if that isn't reason enough to buy the disk, you ought to have it for your next party. Just watch which people avoid taking the tests of marital adjustment and sexual attitudes. All in all, the disk can provide some valuable insight as well as good clean fun.

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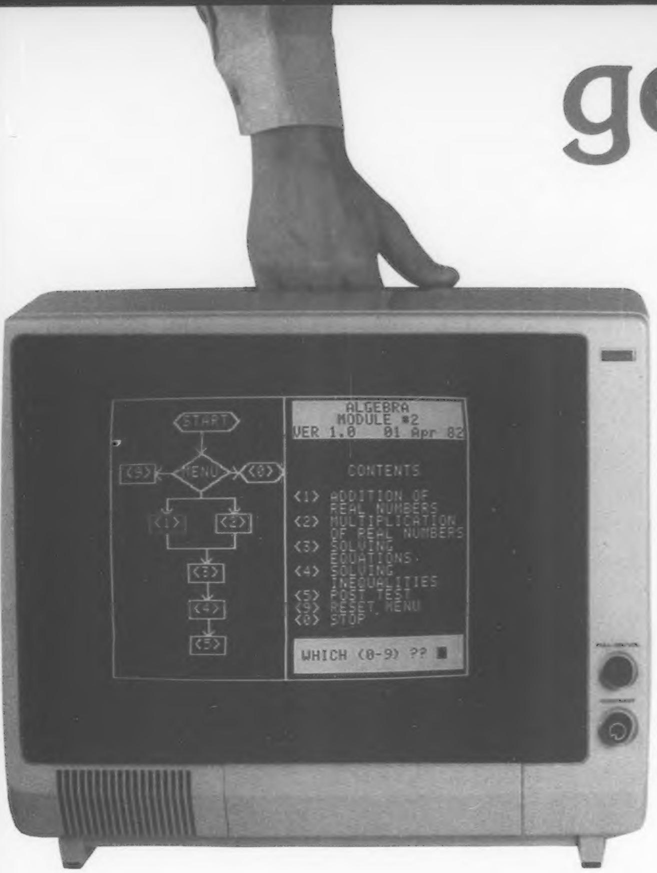

```
    ALGEBRA
   MODULE #2
VER 1.0   01 Apr 82

    CONTENTS

<1> ADDITION OF
    REAL NUMBERS
<2> MULTIPLICATION
    OF REAL NUMBERS
<3> SOLVING
    EQUATIONS.
<4> SOLVING
    INEQUALITIES
<5> POST TEST
<9> RESET MENU
<0> STOP

WHICH (0-9) ?? █
```

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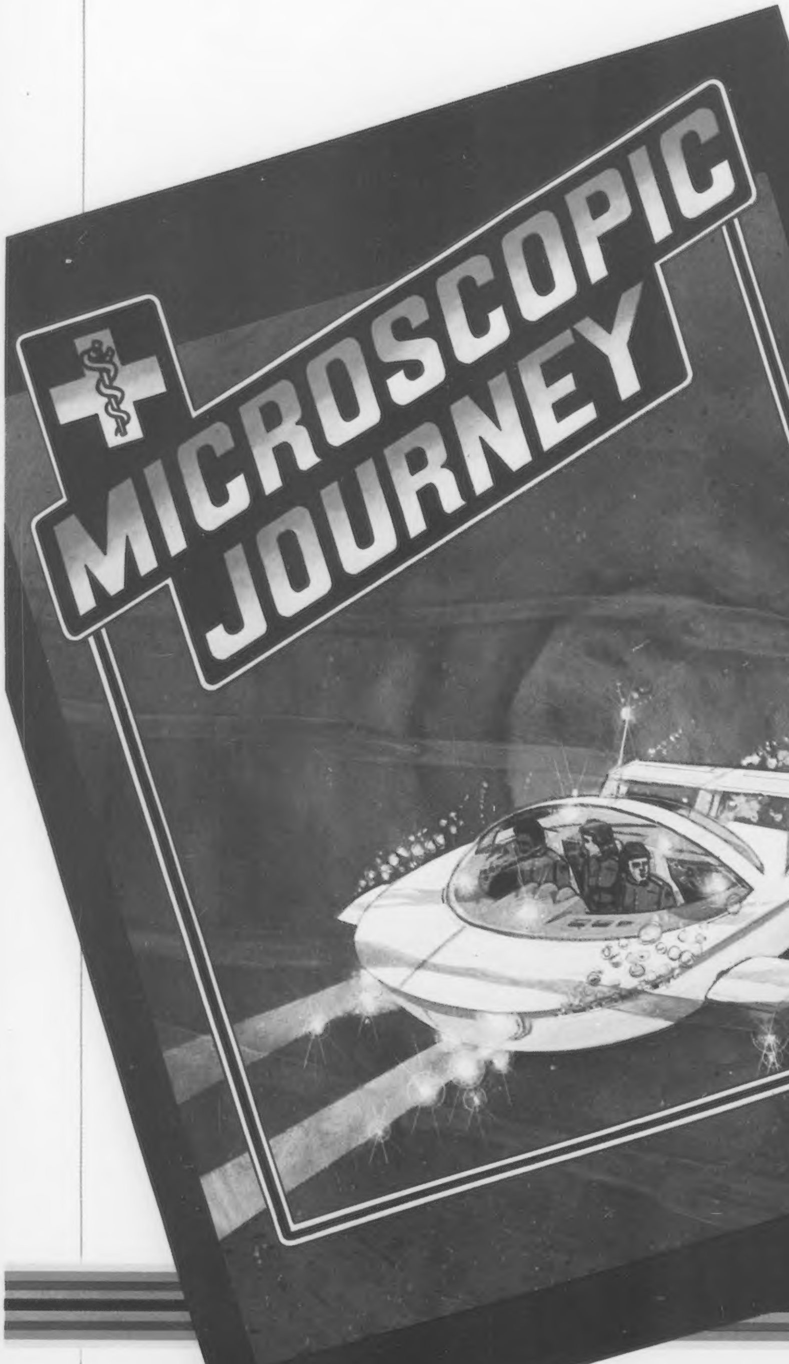

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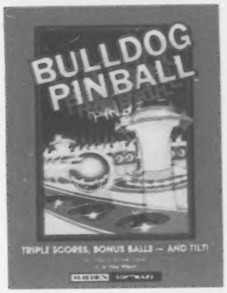
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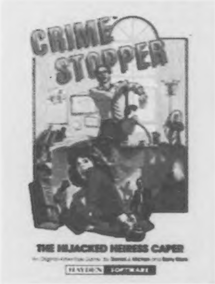
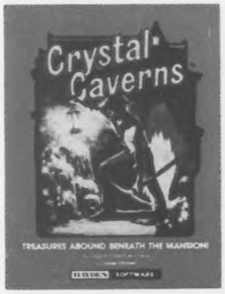

CRIME STOPPER
THE HIJACKED HEIRESS CAPER
HAYDEN SOFTWARE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Or Strangers evaluates how compatible you two are in the following areas: communication, love and romance, values, sex, work and money, spirituality, and play.

"*Lovers Or Strangers* also tells you how well you know each other, by letting you guess what your partner answered on each of the questions."

Although *Lovers Or Strangers* had arrived much earlier for review, it was not until a blustery Saturday afternoon some weeks later that we finally got around to it. Betsy had been editing a mound of manuscripts and I had been reviewing educational software packages. While we are perhaps not the ideal subjects for analysis by this program, we felt that after working together for four years we knew each other reasonably well and could probably give the program a fair evaluation.

The instructions contained on the disk show you how to answer the questions. All the questions are multiple choice and the person sitting on the left uses keys 1-5 for his answers while the person on the right uses keys 6-0 for his answers.

The test consists of 30 questions drawn from a 60-question data bank, so you get a different test each time. On each question, *Lovers Or Strangers* asks you first to select an answer for yourself and then to guess what your partner answered.

The answers do not appear on the screen, but there is a temptation to look over and see which key your partner is pressing. The instructions suggest placing a 3 x 5 piece of paper down the center of the keyboard, wedged in between the keys, but we found that holding one hand over the other was equally satisfactory.

Each question has five answers from which to choose, and there are fifteen different scores possible for each question. For example, if you both choose the same answer, you get a 10-point match. If you choose similar answers you get fewer than 10 points, whereas if you select dramatically different answers, a negative value is assigned to compatibility on that particular question.

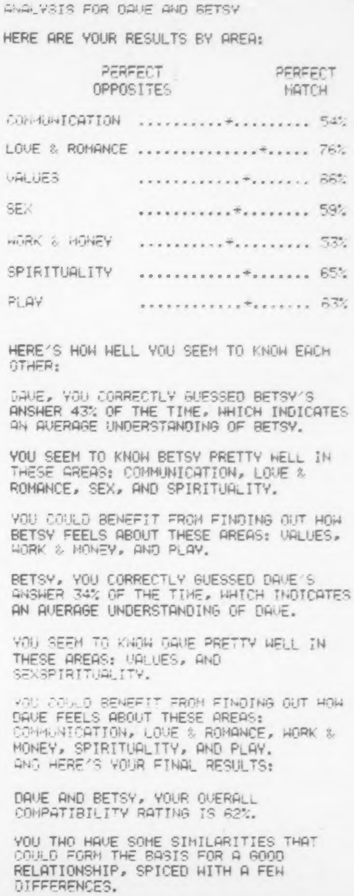
At the end of the test, a graph shows how you and your partner did in each of the seven areas mentioned above. In addition, there is a short analysis of how well you know your partner and a recommendation about finding out how your partner feels about certain things. The results can be printed out if you wish.

The program was good fun to play, and the results were interesting and even surprising (at least to one of us). I don't know if using it 20 years ago would have saved me from a divorce, but for an investment of $29.95, it certainly wouldn't have hurt. ☐

creative computing

SOFTWARE PROFILE

Name: Lovers Or Strangers
Type: Game?
Authors: Al Byers and Annette Long
System: 48K Apple
Format: Disk
Language: Machine
Summary: Evaluate compatibility
Price: $29.95
Manufacturer:
Alpine Software
2120 Academy Circle, Suite E
Colorado Springs, CO 80909
(303) 591-9874



```
ANALYSIS FOR DAVE AND BETSY

HERE ARE YOUR RESULTS BY AREA:

              PERFECT                 PERFECT
             OPPOSITES                 MATCH

COMMUNICATION  ..........*......... 54%

LOVE & ROMANCE ..............*..... 76%

VALUES         ............*....... 86%

SEX            ...........*........ 59%

WORK & MONEY   ..........*......... 53%

SPIRITUALITY   ............*....... 65%

PLAY           ............*....... 63%

HERE'S HOW WELL YOU SEEM TO KNOW EACH
OTHER:

DAVE, YOU CORRECTLY GUESSED BETSY'S
ANSWER 43% OF THE TIME, WHICH INDICATES
AN AVERAGE UNDERSTANDING OF BETSY.

YOU SEEM TO KNOW BETSY PRETTY WELL IN
THESE AREAS: COMMUNICATION, LOVE &
ROMANCE, SEX, AND SPIRITUALITY.

YOU COULD BENEFIT FROM FINDING OUT HOW
BETSY FEELS ABOUT THESE AREAS: VALUES,
WORK & MONEY, AND PLAY.

BETSY, YOU CORRECTLY GUESSED DAVE'S
ANSWER 34% OF THE TIME, WHICH INDICATES
AN AVERAGE UNDERSTANDING OF DAVE.

YOU SEEM TO KNOW DAVE PRETTY WELL IN
THESE AREAS: VALUES, AND
SEXSPIRITUALITY.

YOU COULD BENEFIT FROM FINDING OUT HOW
DAVE FEELS ABOUT THESE AREAS:
COMMUNICATION, LOVE & ROMANCE, WORK &
MONEY, SPIRITUALITY, AND PLAY.
AND HERE'S YOUR FINAL RESULTS:

DAVE AND BETSY, YOUR OVERALL
COMPATIBILITY RATING IS 62%.

YOU TWO HAVE SOME SIMILARITIES THAT
COULD FORM THE BASIS FOR A GOOD
RELATIONSHIP, SPICED WITH A FEW
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Milton Bradley Scores Again

W. Shuford Smith

What does the name Milton Bradley bring to mind? For me, it was a company that manufactured games such as Twister, Yahtzee, Checkers, Life, and Stratego. Thus, I was somewhat dumbfounded on hearing of its entry into the educational software market. Even when I received the boxes with that famous MB logo, I couldn't shake my previous associations. My recurring thought was that personal computers had become such a mass market that every major corporation was getting into the software act.

creative computing
SOFTWARE PROFILE
Name: Language & Math Arts Programs
Type: Educational
System: Apple II 48K
Format: Disk
Summary: Seven packages that establish a games company in the field of educational software.
Price: $45
Manufacturer:
Milton Bradley
P.O. Box 2209
Springfield, MA 01101

After a little research I discovered that Milton Bradley's educational division has been publishing school materials for many years. Their main activity has been in the making of supplemental materials for the primary grades. These new software products, as we shall soon see, are not only a serious offering, but one that may serve as a standard for classroom software in the near future.

The overall company plan appears to involve the release of moderately priced packages ($45) that can be used as unit lessons in the middle grades (5-8). Yet, the content and quality of presentation will allow these products to be used for remedial work with older students. An additional plus is that the programs have been designed for effective use in classrooms with access to only one computer.

Seven separate items are in the current release—four dealing with language arts areas (two each on vocabulary and punctuation) and three handling math units (decimals, division, and mixed numbers). All are intended for use on the Apple II Plus with DOS 3.3. There seems to be no intention at this time to translate these efforts to other computers.

Use of The Programs

One can implement these programs in two ways: as lessons for individuals such as in a home or in a special class, or, in a regular classroom with a normal load of 25 or more students. The true strength of the design appears in the latter application. Indeed, classroom use appears to be MB's goal.

For instance, as one starts through the programs, the first inquiry requests that the student input his class number (1 to 5). If this is to be an individual lesson, a response of 666 will access the main menu to allow a lesson selection. However, since the intended application is at a classroom level, let's look carefully at that situation.

The student would answer the class number question with the proper response. The class roll would then be presented with an additional request that the student indicate the correct number next to his name. From that point forward the computer would direct the appropriate lesson to the screen as well as monitor the results obtained.

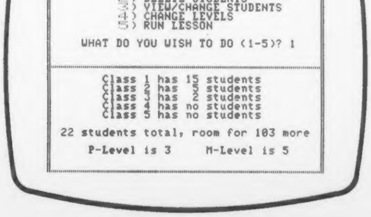
What Milton Bradley has done is to place behind the instructional programs on the disk, an invisible database system capable of handling 125 students. This device manages the heart of a carefully designed, classroom-workable system.

Classroom Procedure

Let's detail this process in a step-by-step manner as it would probably proceed in most classrooms. First, the teacher would take out the included black-line masters and make copies of the pre-test (using either a photo copier or a spirit duplicator). From these results, each member of the class would be assigned to one of three proficiency categories for each skill. These categories are: 1) mastered the content, 2) needs some practice, and 3) needs instruction.

Next, the teacher would boot the disk and when the inquiry for class number appeared, would respond with a 555 plus an invisible Password (located in the Teacher's Manual). This sequence would run the management system and present its menu: 1) Add students, 2) Delete students, 3) View/Change Students, 4) Change Levels, 5) Run lesson. The program allows 25 names for each of the five classes. (See Figure 1.)

Figure 1.



```
              MAIN  MENU

           1) ADD STUDENTS
           2) DELETE STUDENTS
           3) VIEW/CHANGE STUDENTS
           4) CHANGE LEVELS
           5) RUN LESSON

     WHAT DO YOU WISH TO DO (1-5)? 1

        Class 1 has 15 students
        Class 2 has  5 students
        Class 3 has  2 students
        Class 4 has no students
        Class 5 has no students

  22 students total, room for 103 more

     P-Level is 3      M-Level is 5
```

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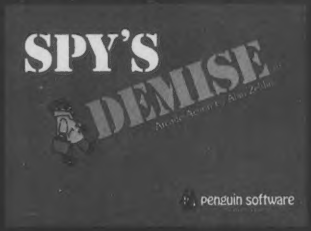
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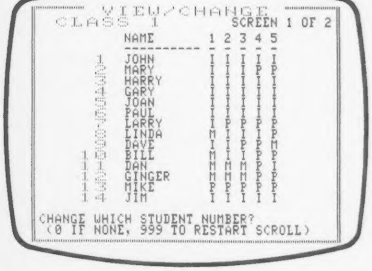
Milton Bradley, continued...

The teacher would enter the pre-test results for each of the students. The names may contain up to 10 characters and the results for each skill are entered as <M>astery, <P>ractice, or <I>nstruction. (See Figure 2.) The practice level is initially set with a criterion of three out of five correct, with mastery being five out of five. The teacher may change these levels as desired. From this point forward the program directs and monitors each child's efforts and can furnish the teacher with an excellent progress record.

If the student needs instruction, the teacher provides it; if practice is required, then the computer lessons are employed; mastery can be checked by both computer and teacher. How well does this device work? Very well indeed! All instructions were clear and every aspect performed without a flaw.

Back in the classroom, the teacher would begin the instruction on each skill to be covered in the unit. The manner in which this phase proceeds is completely at the teacher's discretion. For each skill, Milton Bradley has included reproducible worksheets including both tutorial sheets and practice sheets. In addition, the kit contains mastery tests, student record sheets, and classroom rosters. All of these aids are above and beyond the computer lessons. In other words, almost any teaching style can be accommodated.

Figure 2.



```
         VIEW/CHANGE
 CLASS  1         SCREEN 1 OF 2
        NAME        1 2 3 4 5
        ----------- - - - - -
     1  JOHN        I I I I I
     2  MARY        I I I P P
     3  HARRY       I I I I I
     4  GARY        I I I I I
     5  JOAN        I I I I I
     6  PAUL        I I I I I
     7  LARRY       I P P P P
     8  LINDA       M I I I P
     9  DAVE        I I P P M
    10  BILL        M I I P P
    11  DAN         M M M P I
    12  GINGER      M M M P P
    13  MIKE        P P P P P
    14  JIM         I I I I I
CHANGE WHICH STUDENT NUMBER?
 (0 IF NONE, 999 TO RESTART SCROLL)
```

General Impression

From even the brief description given to this point, one can appreciate the thoroughness of these packages. Yet, this attention to detail does not end with a workable management system. The very first observations of the screen boards reveal an appearance that must be classified as exceptional.

All visual displays are done in hi-res graphics using various character fonts. The upper and lower case letters are highly legible. Various widths and colors are employed with discretion for emphasis. Sound is used both for prompting and to heighten student interest.

Finally, before moving to a program-by-program review, a few other general comments should be made. The programming quality is excellent; I noticed no bugs. The procedures that both students and teachers must follow are not only clear but straightforward. The documentation is well-written and, fortunately, not overly wordy.

Language Arts Programs

This initial release contains four packages that could be used by most language teachers in the middle grades. Their content fills an area in the educational software market that is not yet over populated. They were all written with similar formats, though significant differences are noted in the individual reviews.

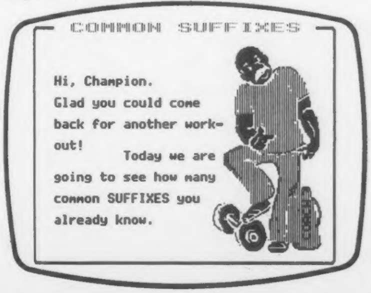
My students told me to write that the game was unnecessary.

First, the group features creative touches, quality graphics, and high interest themes such as outer space and medieval times. Another less noteworthy commonality is the presence of a limited arcade game called Alien Rain. The student earns points on the review drills which are then converted into playing time. The game requires paddles even though not every school-owned Apple has paddles.

Secondly, the game itself is not all that exciting. Believe it or not, my students told me to write that the game was unnecessary; the programs were fine without Alien Rain.

In the classroom, for each student to receive maximum benefit, each program in this series will require some additional examples and explanation. The materials included in the packages will definitely assist in this task. Teachers, take a close look at each of these offerings; I think you will find some excellent tools inside these boxes.

Figure 4.



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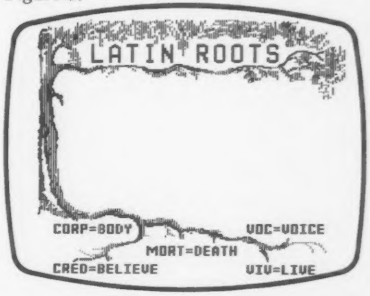
Today we are going to see how many common SUFFIXES you already know.

Prefixes, Suffixes, and Root Words

The Vocabulary Skills: Prefixes, Suffixes, and Rootwords program offers the student a chance to learn some word analysis skills. Milton Bradley's approach is to interweave both common and uncommon word parts into the course of study. The lesson on prefixes includes five common (inter-, dis-, anti-, pre-, and sub-) ones as well as five uncommon (ortho-, tele-, micro-, circum-, and para-) ones. Suffixes are divided into two lessons with one covering the 10 common and one handling the 10 uncommon. Next come 10 common roots, five each of Latin and Greek origin. (See Figure 3.)

Rounding out this package is an introductory concept lesson, a review following prefixes and suffixes, a word building activity, and a final cumulative review.

Figure 3.



Is this type of practice worthwhile? A study of word structure is intended to provide the child with a curiosity about as well as an understanding of some commonalities in our language. However, a danger exists since English is not as heavily dependent on inflections as some languages. Often, a student will lose sight of the sentence context after a course in word analysis. Milton Bradley has tried to prevent this from happening by keeping all exercises embedded in clever and effective sentences. Also, through the mix of common and uncommon examples, a wide range of students can be accommodated and kept interested.

The format of these lessons, and all others in the language arts area, uses a fantasy theme to heighten interest. This program uses a workout simulation complete with a coach, body or mind building exercises, and appropriate pictures, slogans, and the like. (See Figure 4.)

My students did appreciate the cleverness. At the end of the final review drill,

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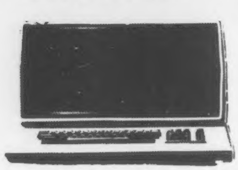

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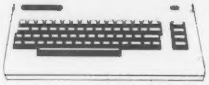

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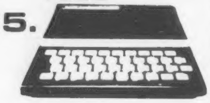

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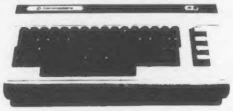

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the students may cash in earned points to play Alien Rain. The child receives graduated points depending on whether the correct response was on the first try, second try, or third try.

This program received consistently high marks from all students; I strongly recommend it.

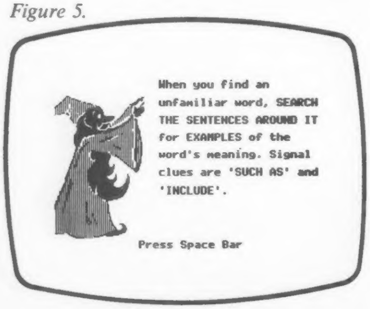
Context Clues

The second set of vocabulary skills deals with an effective but often ignored facet of English study. Since our language is so heavily dependent on syntactical or contextual clues, one would think that a strong emphasis would be placed on helping children understand and use these techniques. Unfortunately, this is not the case. So, it is a relief to see these lessons to assist teachers with the process.

The program begins with an introduction to context, what it is and why it is important to both reading and vocabulary building. The next lesson takes the student through finding the definition of a word within a sentence using such key words as *is, that is, or,* and *meaning.* The student then learns the meaning of a word by understanding a contrasting phrase (some key words are *however, although, but).* At that point, a review lesson is offered to tie together these basic ideas.

The next section involves two lessons: one on making educated guesses and another on inferring meaning from examples in the sentence. The final lesson consists of a cumulative review covering all previous material. For each lesson, students receive basic rules, multiple-choice examples, practice drills, and a five-sentence mastery test.

Figure 5.



```
When you find an
unfamiliar word, SEARCH
THE SENTENCES AROUND IT
for EXAMPLES of the
word's meaning. Signal
clues are 'SUCH AS' and
'INCLUDE'.

Press Space Bar
```

As in the other programs in this area, a theme is used. For context, it is a wizardry emphasis set in a medieval time. (See Figure 5.) Thus the sentences, instructions, and characters are all true to this setting: Wouldn't you "gag" on a reptile omelet?

For teachers who have not yet emphasized the syntactical clues of sentences or understood how to teach contextual understanding, this package should provide many valuable ideas. For those who already appreciate just how effectively one can increase not just a youngster's vocabulary but also his reading comprehension with this approach, Milton Bradley's *Context Clues* will be a welcome addition to the arsenal. All in all, it represents a fine educational value.

Punctuation Skills: Commas

The commas program, I believe, may have been among the first written since it contains several flaws. First, it requires the use of a paddle. The paddle positions and fires the Comma Cannon. The cannon is a cute device used to place the punctuation in the correct spot. Unfortunately, as previously mentioned, not all Apples have paddles, and Milton Bradley provides no alternate method.

Second, the tutorial language seems higher than the skills being covered. Certainly, a greater disparity exists here than in the other works in this series.

Since the comma is such a heavily used mark of punctuation, Milton Bradley has devoted several lessons exclusively to its use. The first three skills covered are setting off introductory elements, separating items in a series, and isolating interrupters. All of these uses are shown with examples of single words, phrases, and clauses.

Following the first three lessons, a review is offered. Next comes a section on independent clauses. Then follows placement of commas in dates, addresses, letters, and titles. The last lesson is the end-of-unit cumulative review.

As with the other programs, a special theme—outer space—is used with commas. This approach is generally appreciated by the students, though some of the strange planet and character names threw them for a minute or so. As is too often the case in exercises, the number of examples and counterexamples was too limited. Have some more ready, teacher!

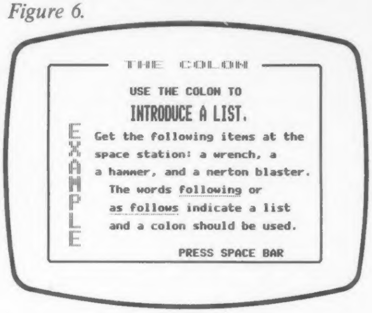
I did find that the Helpful Hints used with some of the Rules were very useful to the students in improving their accuracy. Finally, one additional suggestion to the programmers: On all these exercises, the student's reward is determined by the number correct out of five problems. However, in the last lesson, Dates, Letters, etc., one could correctly place five out of six commas in a letter, forget one, and not receive any credit. The kids gave a big "unfair" to that kind of scoring.

If the Apple is equipped with paddles, this package should prove useful to any middle grade teacher, especially those whose students suffer from *commaitis.*

Endmarks, Semicolons, and Colons

This second offering in the punctuation area uses the same space theme found in commas. However, there is more extensive use of hi-res pictures, and the tutorial is simpler yet more clever in language use. In addition, the game paddles are no longer required. Positioning the cannon to fire a punctuation mark is done with the right and left arrows. To place the punctuation, the student simply presses the appropriate key on the keyboard.

Figure 6.



```
        THE  COLON
     USE THE COLON TO
    INTRODUCE A LIST.
E  Get the following items at the
X  space station: a wrench, a
A  a hammer, and a nerton blaster.
M    The words following or
P    as follows indicate a list
L    and a colon should be used.
E
              PRESS SPACE BAR
```

The content consists of one lesson on the period, one on exclamation and question marks, two sessions on the semicolon, and a final lesson on the colon. (See Figure 6.) There is one cumulative review following mastery of the five lessons.

The lessons provide adequate information for students to become quite successful. The pace through these small but essential parts of grammar is excellent. In summary, my trial students gave this program high marks for graphics, creative wording of sentences, and overall enjoyment while learning and reviewing.

Mathematics Programs

The current group of math packages includes three—division, decimals, and mixed numbers. Unlike the language arts areas these programs are devoid of humor and thematic gimmicks. What they add is a tutorial on the process (algorithm) involved. While this feature is no substitute for effective classroom instruction, it does provide clear reinforcement that may give a better understanding to many students. Also included are a readiness lesson and some very effective speed drills which are *not* under control of the management system. Thus, these beginning exercises can be used independently of the rest of the unit.

All three sets are appealing in their appearance using a school related backdrop (chalkboard, textbook, or notebook) together with hi-res fonts. Both the division and decimal packages seem

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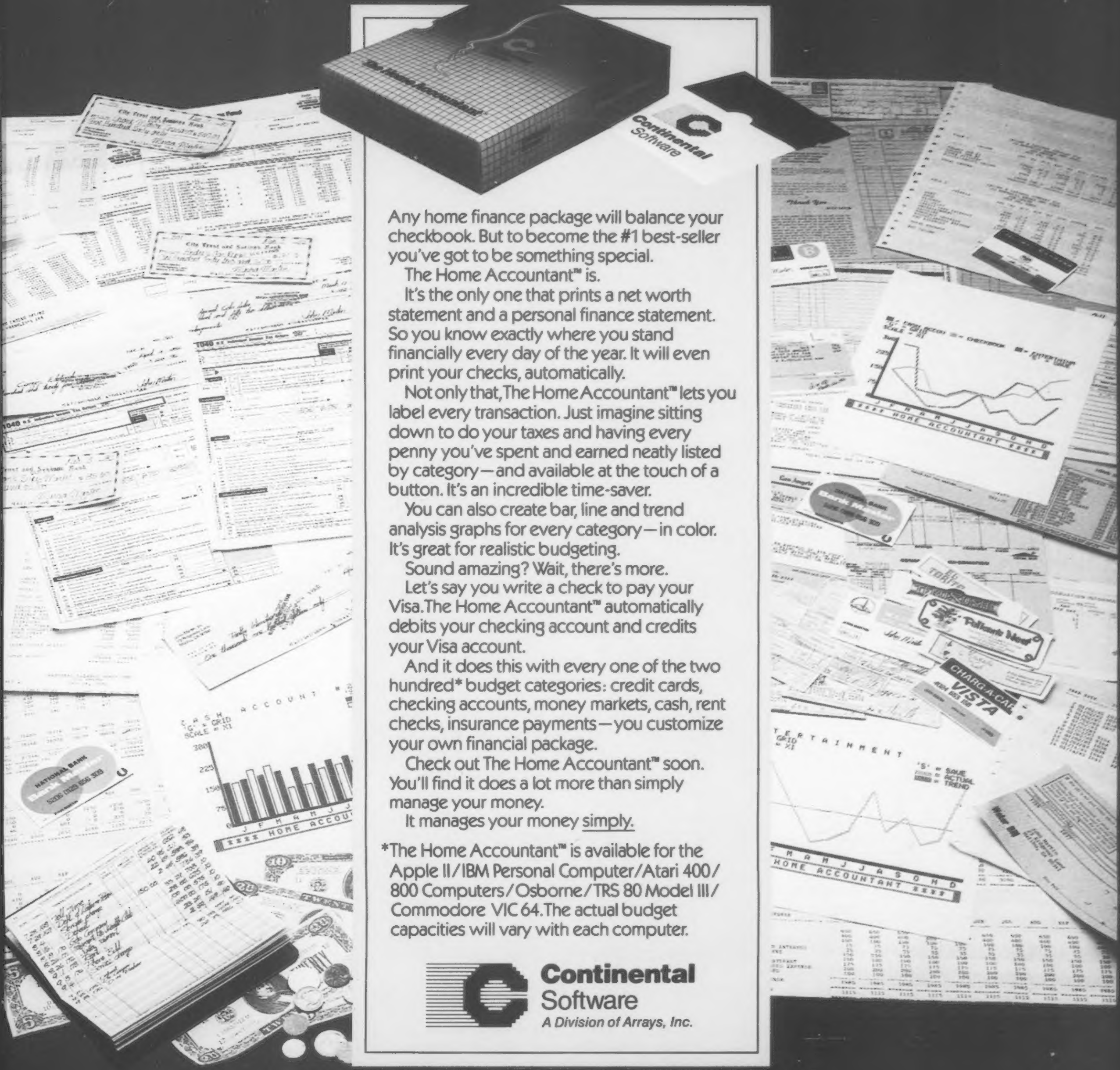

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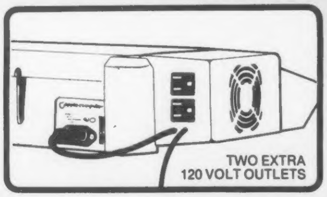
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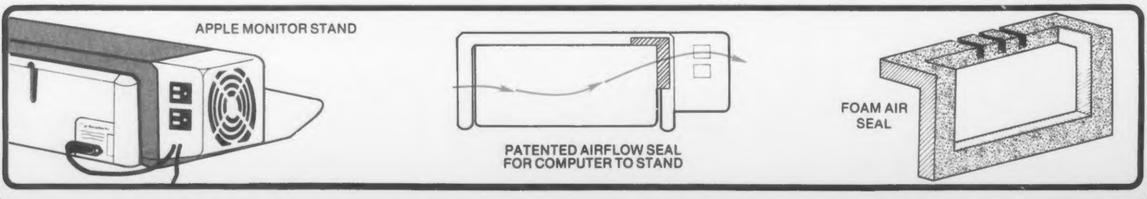
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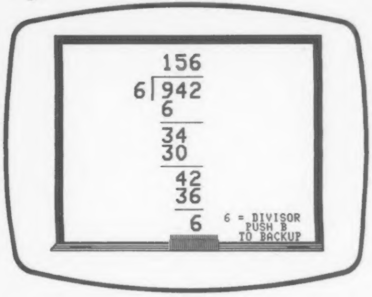
to employ a random number generator, while the mixed numbers program draws upon an existing bank of problems. The overall level is quite high—that is, once a student has mastered these programs, one can more than safely assume that he adequately understands the process.

Division Skills

The Readiness Skill for the *Division Skills* program is entitled Fast Facts. In actuality, it is a well-conceived, speed drill covering simple division. The time allowed is adjustable up to 540 seconds, and the number of problems presented can vary from 1 to 90. Incorrect responses are shown with the right answer instantly, and again at the scoring summary. As the manual suggests, by keeping one factor (either time or number of problems) constant, a student can measure progress over the year. This part of the package should find heavy use in and of itself.

Figure 7.



```
   156
 6|942
   6
   34
   30
    42
    36
     6   6 = DIVISOR
           PUSH B
          TO BACKUP
```

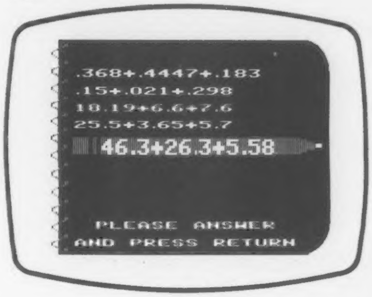
There are five skills covered in the computer-managed part of the program plus a final review. Lesson One deals with one-digit divisors, while Lesson Two handles two-digit divisors. (See Figure 7.) For some students, two helpful little features are the V and B keys. Pressing V displays essential definitions, while B gives a backup command so that the student can change an incorrect estimate. The last three lessons deal with problems that have remainders. Lesson Three takes care of whole number remainders, Lesson Four covers fractional remainders, and Lesson Five practices decimal remainders.

This program is marked by clear displays, challenging problems, and a nice step-by-step walk-through approach.

Decimal Skills

The Readiness Skill for the *Decimal Skills* program covers four basic concepts. First, the student must be able to identify which column (from thousands to ten thousandths) contains a certain number. Secondly, when given a written decimal number, the student must be able to convert it to its numerical format (one and four tenths = 1.4). Next, the comparison of two decimal numbers (<, >, and =) is featured. Finally, students must be able to order numbers from the smallest to the largest.

Figure 8.



```
.368+.4447+.183
.15+.021+.298
18.19+6.6+7.6
25.5+3.65+5.7
46.3+26.3+5.58


  PLEASE ANSWER
AND PRESS RETURN
```

As with the other readiness activities, these have a time choice, from 1 to 999 seconds, and a number-of-problems choice, up to 25. The answer is displayed on a large pencil which appears to rotate after the response is corrected—clever programming.(See Figure 8.)

Following this fairly complete readiness level, four skill lessons are offered: addition, subtraction, mutiplication, and division of decimals. Have students bring their scrap paper as these get involved. For example, in the addition and subtraction sections, all problems are displayed horizontally. Of course, the student must line them up vertically and use zero place holders as necessary. Numbers generally contain at least four digits. Since alignment is critical when working with decimals, an instructional program must also assist in this area if at all possible. Milton Bradley's offering rates a "very good" in helping students with this aligning skill.

The summary by the raters found *Decimal Skills* to contain a demanding, yet comprehensive coverage of an intermediate math concept.

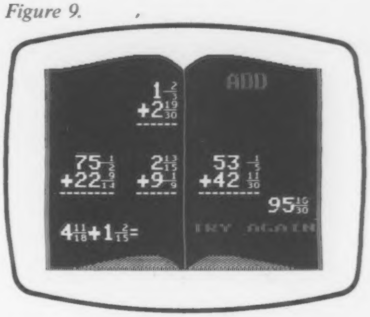
Mixed Number Skills

In the *Mixed Number Skills* package three areas are considered readiness: converting mixed numbers to improper fractions, converting improper to mixed, and comparing mixed numbers. For the speed drill, one can choose up to 25 problems and up to 999 seconds. As with the rest of this series, the readiness exercises are a real bonus, and make periodic reviews a snap.

The four basic parts of this program involve addition, subtraction, multiplication, and division of mixed numbers. In the addition and subtraction areas, included are like and unlike denominators, combinations of whole and mixed, and regrouping. (See Figure 9.) In multiplication and division, there are problems with no common factors, problems with one set of common factors (in my day, this was called cross cancelling), and problems with two sets of common factors. The obvious point would seem to be that this unit, like the others in math, covers the upper range of the targeted skills. Lots of scratch paper and time are needed by the students.

How does this program, and the rest of the Milton Bradley line, stack up against the competition? Many math programs have been written for the Apple. At least a few of them contain tutorial sections as well as extensive drill and practice units. The Milton Bradley tutorial does not contain as good a step-by-step formula as some that I have seen. But MB's *Mixed Numbers* includes several possibilities not in other programs, such as a speed drill, cross cancelling, and very challenging problems.

Figure 9.



In addition, though many competitors' screens are very good, Milton Bradley's are excellent. Add the supplemental black-line masters and the management system, and you have an impressive package. I think that in a classroom, I would have several products. A program like Edu-Ware's *Fractions* would serve as the beginning tutor and Milton Bradley's *Mixed Numbers* as the backbone of the unit. Thus, for under $90, I could create quite an effective course plan on fractions.

Conclusion

Milton Bradley has made an auspicious entrance into the educational software field. It is a pleasure to be able to work with products that have obviously been very thoroughly field tested before their introduction. It would be nice to see more demonstrations and tutorial experiences in these programs, but they accomplish their intent quite well. They are high quality teacher aids, designed to be used in a real world classroom. From now on, the Milton Bradley logo will have quite different connotations for me. ☐

Karel The Robot

John J. Hirschfelder

Robots are exciting all right. They do a terrific job on the assembly line, and someday they may clean the house, walk the dog, and keep us company. But what can they do for us today?

One thing they can do and are, in fact, doing is teaching programming concepts to children and adults. One such cybernetic teacher is Karel the Robot.

Karel is an instructional aide for people who want to learn Pascal on the Apple II. That is a welcome concept, indeed, for the multitudes whose first programming language is Basic, because learning Pascal not only calls for mastering many new ideas, but also for unlearning a variety of practices which are essential in Basic but bad habits in Pascal.

The author of this package, Richard E. Pattis, teaches programming at Stanford University. He invented Karel for his students and wrote a short (106 page) book, *Karel the Robot: A Gentle Introduction to the Art of Programming*, published by John Wiley and Sons. In the preface, Pattis observes, "The first few weeks of a programming course are crucial to the students' perception of the subject; it is during this period that they briefly glimpse the aesthetics of the discipline and are most receptive to new ideas. By starting with Karel the Robot, it will be easy for students to absorb a large number of useful, important, and sophisticated concepts quickly."

The book is used as a text at Stanford and at the University of California, Berkeley, for the first one or two weeks of introductory programming classes.

Complex Simplicity

Karel is a very simple automaton. He lives on your monitor screen in his world, which is laid out with north-south avenues and east-west streets. Karel himself is always at an intersection. When he moves, one "step" is a full city block long, and he can face north, south, east, or west. On your screen, he is represented by ∧, V, >, or <, depending on which way he is facing.

Karel's world is not empty. Some streets are blocked by walls, and on some corners there are markers called "beepers." (Sorry, they don't beep.) Karel carries a bag of beepers, and he can pick them up and put them down. He is controlled by a program which you write. The following is a complete list of the actions Karel can perform.

turnleft

move (forward one block)

pickbeeper (from the ground to his bag)

putbeeper (from his bag to the ground)

turnoff

Karel can also survey his world and make decisions based on his environment. He can tell if there is a beeper on the corner where he is standing; whether there are any beepers in his bag; and whether his front, right, or left is blocked by a wall.

That's all! By combining these statements with control structures in a Karel program, you can make the robot wander about his universe performing some very complex actions.

But what does this have to do with Pascal? Pattis has designed his robot language so that each of its syntactic features and control structures closely resembles a corresponding feature of Pascal, so that writing Karel programs is training for graduation to Pascal.

A Basic program begins with some array definitions which are followed by a long, unbroken stream of numbered executable statements. Sprinkled through the program there may be some sub-

creative computing

SOFTWARE PROFILE

Name: Karel the Robot

Type: Educational (programming tutorial)

System: Apple II 64K (RAM card), Pascal text editor

Format: Disk

Summary: With the book of the same name, a unique introduction to Pascal

Price: $242

Manufacturer:
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routines, called by GOSUB statements. The code making up a subroutine may be all in one place, but it need not be. It ends with RETURN but may begin with anything—in fact, it can be entered at any point at all. The subroutine has no variables of its own, nor any parameters as a function has. Aside from GOSUB, the only control statements of significance are GOTO, IF . . . THEN, and FOR loops.

Differences In Pascal

A Pascal program looks entirely different. It begins with definitions for named constants, and follows with declarations of all the program variables —not just the arrays. Then come the subroutines, called *procedures*, each of which has a precisely defined beginning, a single end, its own variables, and possibly some parameters. At the very end comes the body of the program, which is usually quite short and consists mostly of procedure calls. There is a GOTO statement in Pascal, but it is rarely used.

Thus writing a Pascal program requires a different kind of organizational thinking than writing one in Basic. It is the Pascal type of program organization—called *top-down* or *structured* programming—that the Karel language teaches. So let's look at some of the concepts of the Pascal language, and see how features of the Karel language teach them.

Pascal has extensive data structuring, including records as well as arrays. Karel has none (except for Karel's world, which is not variable); its purpose is to teach program organization, not data organization.

Pascal has compound statements, delimited by BEGIN and END. For example

`BEGIN X:=X+1; Y:=Y+1 END.`

A Pascal compound statement is not the same as a Basic multi-statement line, which is just a space-saving convenience. Compound statements work nicely with IF statements, which in Pascal can have ELSE clauses. Karel has these too, and they can be used to define a complex action. Although Karel can only turn left, we can write a compound statement to make him turn right:

`BEGIN turnleft; turnleft; turnleft END.`

The more complex statement in Figure 1 tells Karel to go one block forward, unless the way is blocked, in which case he is to move two blocks backward.

Pascal has FOR loops like Basic, but it also has the WHILE . . . DO statement which causes some action to be performed as long as some condition remains true. Karel has this feature in exactly the same form. The following statement instructs Karel to move forward until he comes to a wall:

`WHILE front-is-clear DO move.`

A typical Karel program, like a well-written Pascal program, is 95% new instruction definitions and 5% body.

Finally, Pascal has the procedure. If all data are ignored, a procedure is just a compound statement given a name, so that is can be cited elsewhere in the program. Karel's analog is the new instruction definition. Figure 2 shows two examples.

A Karel program can be built from these constructs. Figure 3 is Karel following a wall to his right, looking for a beeper.

And there you see the fundamentals of the structured programming style: procedures, blocks, if-then-else, while-do. A typical Karel program, like a well-written Pascal program, is 95% new instruction definitions and 5% body.

Summary

The Karel software package consists of two disks, labeled KAREL: and KAREL2: Each disk boots the UCSD Pascal operating system. A user's manual, which contains clear and complete instructions for configuring a one or two drive system, for using the Karel simulator program and for running the demonstrations, is included.

The package does *not* contain a copy of the Pascal text editor. You must provide this yourself. Nor does the manual tell you how to use the text editor, or anything about Karel's language—for this you must read Pattis's book.

The simulator is comprehensive and easy to use. Besides putting Karel through his paces as defined by your program, it offers a choice of speeds, single-stepping, and other debugging aids. The simulator includes a "world-builder" for defining Karel's environment and initial conditions. With the world-builder, you can build and destroy walls, move Karel around, and strew beepers on street corners. You can't pick up a beeper, so if you make a mistake and put one where you don't want it, you have to start over.

The Karel package is aimed at the high school or college classroom in which Apples and Pascal are available. For about the first two weeks of a Pascal class, Pattis's book can be used as a text, with assignments from the numerous exercises in the book to be run on the computer. Then the class can move quickly on to data structures and Pascal. Karel can be fun, and there is some danger of getting distracted from the real objective and spending too much time with Karel.

I recommend a serious look at Karel to any Pascal instructor. If, however, you are an individual programmer, have just gotten Pascal for your Apple, and are trying to learn the language, I suggest that you get any of the Pascal tutorials and jump right in.

The two-disk Karel package with manual costs $85 and is available in a standard 40-column version and in a version for users of 80-column cards. Also available, for $150, are two disks containing solutions to all the problems in the *Karel the Robot* book. Versions of the simulator for the IBM Personal Computer and the Terak are forthcoming. ☐

Figure 1.

```
IF front-is-clear THEN move
  ELSE BEGIN turnleft; turnleft; move; move;
             turnleft; turnleft END.
```

Figure 2.

```
DEFINE-NEW-INSTRUCTION turnright AS
  BEGIN turnleft; turnleft; turnleft END;

DEFINE-NEW-INSTRUCTION sidestepleft AS
  BEGIN turnleft; move; turnright END;
```

Figure 3.

```
BEGINNING-OF-PROGRAM
DEFINE-NEW-INSTRUCTION try-again AS
  IF right-is-clear THEN
    BEGIN turnright; move END
  ELSE IF front-is-clear THEN move
  ELSE IF left-is-clear THEN
    BEGIN turnleft; move END
  ELSE
    BEGIN turnright; turnright; move END;
BEGINNING-OF-EXECUTION
  WHILE not-next-to-a-beeper DO try-again; turnoff
END-OF-EXECUTION
END-OF-PROGRAM.
```

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My Five Year Old Knows Basic

Peter Favaro

A friend of mine recently called to tell me that he suspected his seven-year-old daughter had a "learning problem." Six months after purchasing a Commodore Vic-20 home computer he is worried because she just can't seem to grasp the Basic programming concepts of strings and arrays. I asked him what in the world would make him think that she could be capable of understanding a complex concept like that. He replied, "They're learning about computers in school aren't they?"

Poor kids, I can see it all now. In ten years we will be labeling children who cannot successfully and efficiently program in at least two machine languages "computing disabled." With the current emphasis on computer literacy, many educators are pushing the fact that children should know as much about computers as possible, at the earliest possible age. A recent educational report speculated that 25 years from now children would need the equivalent of a Master's degree in computer science before they graduated high school.

I almost pity the parents of these poor children who will surely sigh in frustration, "Just when I learned the new math!"

While I believe that children growing up in the computer age should certainly be computer literate, there is a danger in expecting too much too soon. The six-year-old machine language programmers that we read about in the papers are invariably gifted and are the exception rather than the rule. Attempting to teach concepts that are beyond what children are capable of understanding at various developmental levels is likely to cause enduring negative perceptions of the computer experience and keep some children permanently turned off to computers.

This article discusses a developmental framework of children's cognitive and behavioral competencies aimed at helping parents and teachers understand what children are capable of learning about and on computers, and at what ages or stages of development. Before presenting this framework, some preliminary concepts are helpful. One is the notion of *readiness*, and the other is understanding some of the fundamental differences between human language and computer language.

Readiness

The term readiness implies that a child will learn a concept, behavior, or skill, only when he is developmentally prepared and not before. For example: Two children may be the exact same chronological age, and have had similar experiences through life. For the sake of this example, let's say they are both seven years old. One of these children may be extremely proficient at printing his name, spacing the letters equidistant from one another, keeping within the lines and making everything in the correct proportions. The other child may have difficulty manipulating the pencil, may draw wavy, unsteady and misproportioned lines and make many errors.

One hypothesis might be that the second child has a visual handicap. Perhaps. But an equally feasible possibility is that the child is not developmentally "ready" to perform that task. When this is the case, no amount of training will help that child write neatly, as any parent who has tried to teach a child in this situation will attest. In other words this child has not reached a developmental state of "readiness" for performing this

---

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writing behavior. One cannot assume that all children will be ready to perform certain tasks at the same time; with some behaviors individual variations of months or even years are quite common.

The concept of readiness applies not only to outward behaviors, such as walking, talking, and writing. It also applies to a child's ability to solve problems, link together ideas, understand concepts and think in a logical, orderly fashion. These abilities develop gradually over the first 15 or so years of life, and this is the major reason why most first, second, and even third graders cannot learn advanced programming languages. This does not mean, however, that they cannot benefit from interacting with the computer on some other level.

Children seem to pick up computer programming languages, as they pick up most foreign human languages, much faster than adults.

People have commented on the fact that children seem to pick up computer programming languages, as they pick up most foreign human languages, much faster than adults. While this may be true, it is not necessarily true for the same reasons, and should not be used as an excuse to push advanced language programming on young children.

Children, as a rule, learn most things faster than adults because more of their experiences are centered around learning. All languages are symbolic ways of communicating, governed by syntax and grammar rules. In comparing computer language to human language we see that the rules which govern computer language are far more strict and precise.

A young child not yet two years old can say to her mother, "Mommy, give Jenny muk," and still be understood, even though there is an error in the command. Programming in a computer language such as Basic always requires correct spelling and syntax to obtain the desired outcome of the command.

Errors that are detected by the computer and redirected to the user give little hint as to what must be done to correct the error, and tell you only what and where the error is. Human feedback regarding errors in communication can be more precise in clarifying the objectives of the communication.

A third difference between computer language and human language is in the way the two are processed and received on the sensory channels. Human language is a combination of visual, auditory, and tactile behaviors. The same sentence said with different gestures can mean entirely different things.

Computer language is primarily a written language. It is communicated in written form and basically understood in written and visual form, except for those occasions when a beeping noise or other sound tells us that something is happening with the computer.

Developmental Prerequisites

Understanding that the precision, structure, and limitations of programming languages make it different and more difficult for very young children to learn computer programming, let me point out a few other developmental prerequisites that are necessary for this task. Computer programming requires a knowledge of the basic arithmetic operations. This means more than just an understanding of the times tables. It requires an understanding of number concepts and relationships, such as "greater than," "less than," and "equal to."

Creating an algorithm to help solve a problem often requires a rather advanced knowledge of algebra and trigonometric functions that aren't taught until the later primary grades. Computer programming requires that the child programmer have the ability to put aside the egocentric stance that is such a common characteristic of young children.

Programming requires the ability to "think like a computer," following the logic that the computer would follow to solve a problem. Similarly, programming requires an understanding of sophisticated problem solving strategies to master the use of conditional and branching statements, skills which are not attained until fourth grade at the earliest. Along with this, other requisite skills include sequencing ability, memory and mnemonic, skills, and organizational and planning abilities.

The theory of intellectual development formulated by Swiss psychologist Jean Piaget serves as a useful model to help understand the limits and capabilities of children across the developmental continuum. Piaget's theory assumes that children pass through a series of stages in cognitive skills from infancy through adolescence. Pressures from the environment (especially the learning environment), cause the child to adapt to it and organize his thinking in new ways.

The Sensorimotor Stage

In the earliest stage of development in Piaget's framework, the sensorimotor stage, which lasts from birth until approximately two years, the child moves from instinctual reflex actions to symbolic activities as he begins to understand that he is separate from the environment. During this stage, there is a limited ability to anticipate the consequences of actions.

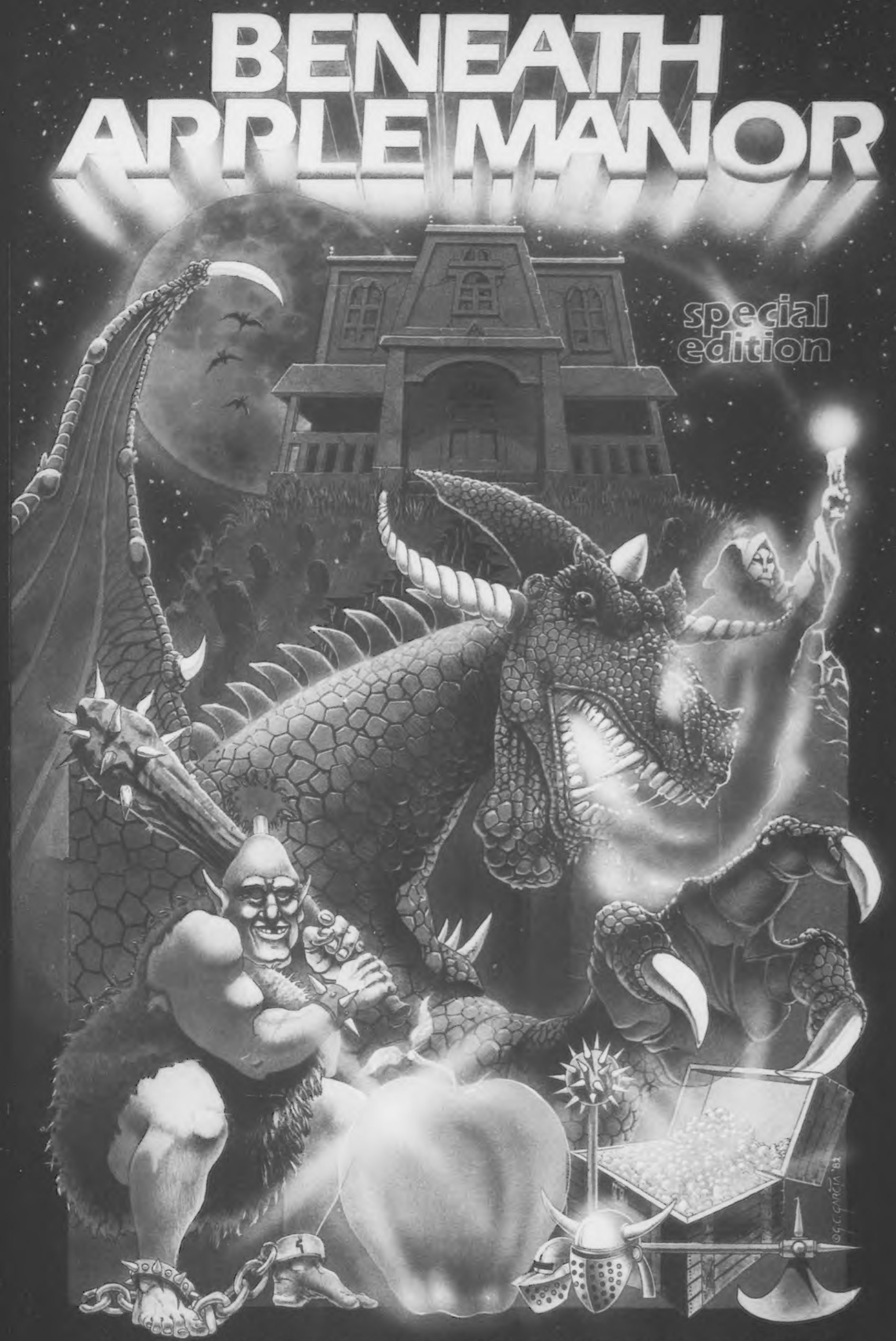
What can a child learn from computers at this young stage of development? On the surface, perhaps not much, but when you consider the advanced color graphics and sound capabilities of today's microcomputers, they seem like the ideal tools for creating a most elaborate "busy-box" for the very young child. Since fascination with colors, changes in shape, sound and patterns are essential elements in the experimental world of children at this stage of development, sensory stimulation by computer may serve the same functions that brightly colored toys and objects hanging over the cribs of infants today serve. Programmed shapes and swirls that move across the screen, change size and shape, appear and disappear may help train visual reflexes, as well as become a source of interest and pleasure for the infant or very young child. Although research has yet to bear this out, it is certainly a question that merits further investigation.

The Preoperational Stage

The second stage in Piaget's developmental framework is called the preoperational stage and spans the two to seven year age range. During this period, the child begins to gain control over his environment, largely because of his ability to use language to express ideas. There are, however, still many limitations which prevent the child from performing mental operations as well as he can perform physical ones. These restrictions are very evident during the early parts of this phase and gradually disappear as the child enters the primary grades.

The limitations of preoperational thinking include the belief that inanimate objects can have human qualities, the inability to recognize that matter is conserved regardless of changes in form, the inability to understand groupings and hierarchical configurations, a narrow concentration on one aspect of a situation to the exclusion of all others, an inability to understand that something can have more than one meaning.

One child I know who is in the preoperational stage became very excited when his mother sarcastically announced that his sister was late for dinner by saying that she would soon "grace us with her presence." The child, thinking that this statement meant that she would come downstairs and give



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everyone at the table "presents," became extremely happy, but later cried in frustration and disappointment when the word was not kept. No amount of explanation could convince him that there was more than one meaning to the word "presents."

Although the abilities of children at this age are limited to the physical, children at this level can begin to learn much from computers, even though programming skills are still out of the question. Children of six or seven can easily learn to boot a disk, work a joystick controller, and use a keyboard.

At this stage of cognitive development, the computer can become a useful training tool to teach number and letter recognition, color discrimination, sight vocabulary, and some number skills. Since this period covers a wide span of ages, it would not be realistic to think that a two-year-old could accomplish the same tasks as a seven-year-old.

I have found, however, that some twos, many threes, and almost all fours can manipulate both joysticks and paddles surprisingly well. These children can have lots of fun drawing swirls and scribbles with the joystick using a relatively simple Basic program. Although this may be more fun than educational, it does stimulate various eye movements, gets children to use their eyes and hands together, and provides an opportunity for attaining mastery over an environment.

Children of six or seven can easily learn to boot a disk, work a joystick controller, and use a keyboard.

Children at the upper range of this developmental period (5 to 7) can start to learn spelling exercises like Hangman, and game-oriented drill-practice exercises in CAI. Exercises such as these have often been called fancy flash cards, but this should not be looked at negatively. Both flash cards and the computer provide training for a task that is boring but necessary—memorization. Some things are best learned by memorization and flash cards as well as computer assisted drills. Both provide the practice necessary to learn something by rote.

The Concrete Operations Stage

The third stage in Piaget's developmental framework is called the concrete operations stage and lasts from the seventh year until approximately the eleventh year. During this period many of the limitations of the preoperational stage disappear, as the child gains concepts of size, spatial relationships, and conservation of matter. In this stage the child can manipulate more than one aspect of a problem at a time and can do math problems and some word problems in his head. The major limitation of this developmental phase is the inability to think and perform in the abstract. The abilities of the concrete operational child are limited by the events, objects and physical representations at hand.

In the later years of this period, children can start to become familiar with some of the Basic language commands, like the PRINT, INPUT, and GOTO statements. At this level children can learn how to solve simple arithmetic problems using the computer primarily as a calculating tool. CAI tutorials and practice drills are very easily understood and enjoyed and can be implemented without much help from the classroom teacher or parent since the children now possess adequate reading skills. Using the computer to construct a model or

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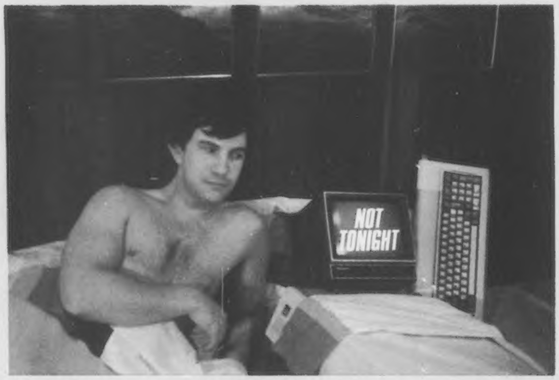

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simulation from scratch, and programming with advanced concepts such as conditional and branching statements are still beyond the capabilities of most children at this stage because they lack the sophisticated abstract reasoning ability required.

The Stage of Formal Operations

The final stage of development in Piaget's conceptual framework is the stage of formal operations and includes ages 11 through about 14. Piaget believes that by the time a child achieves the level of formal operational thought, he has all the cognitive "equipment" necessary to construct theories, design elaborate tools, and do higher level problem solving tasks.

The only thing that separates the cognitive abilities of a child who has achieved this level of thinking from a scientist or engineer, Piaget believes, is the content of what is being thought about, not the ability to manipulate that content. The formal operational child can make judgments based on abstraction and speculation and needs no concrete frame of reference. Problem solving can be accomplished by deductive hypothesis testing in an orderly scientific fashion, using mental strategies that do not necessarily come from experience.

During this period children begin to understand and use sarcasm, double-entendre, and metaphor. They can be taught to exploit the computer to its fullest capacity, and are ready for their first real experiences in higher language programming. Simulations can be developed (the nuclear power plant simulation *Scram* from Atari was developed by a 14-year-old), and learning about computers can be facilitated through the understanding of computer architecture.

> ***Frustration is a natural part of almost every human experience almost every day.***

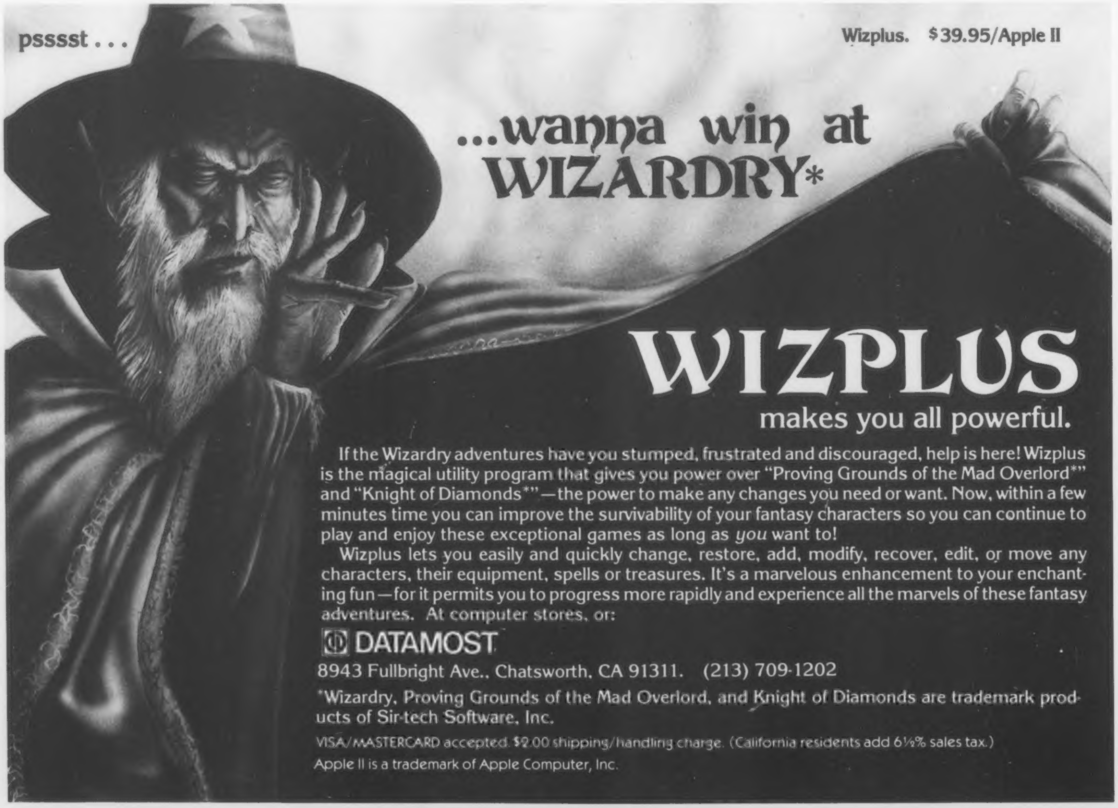
At this level children can create their own computer assisted instruction tools and exercises as well as benefit from drills and tutorials. This is not to say that every 14-year-old can or will be a master programmer, it simply means that, developmentally, children who have achieved the milestones of formal operational thinking will be ready for the experience of learning about more advanced computer concepts and applications.

Behavioral Sophistication

An understanding of the cognitive abilities of children is important in determining what computer experiences are most appropriate for them. However, behavioral competence is equally important, and can affect whether a child is ready to begin using a computer. Behavioral factors which will influence a child's ability to learn about and benefit from the computer include attention span, frustration tolerance, ability to delay gratification, perseverance, self-monitoring ability and self-motivation, and autonomy.

Attention span is, of course extremely important and must be carefully considered particularly with young children. Physical factors such as eye strain can cause fatigue and sometimes even headaches in children who must attend to a CRT for long periods of time. The attention span for most four- to six-year-olds who do one task over and over again is between five and ten minutes.

As childen get older, their attention spans gradually increase so that by the time a child reaches the age of 10 or 11 he can sit at a task for 40 minutes or so.



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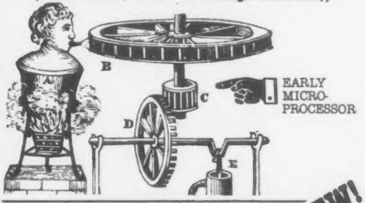

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```
10  FOR A = 1 TO 22: PRINT CHR$(ASC (MID$(
   "IJ—!IPX(T!ZPVS!TJTUFS@", A, 1))—A/A);
20  FOR B = 1 TO 4: C = PEEK(49200): NEXT B, A
```

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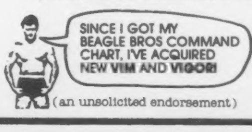
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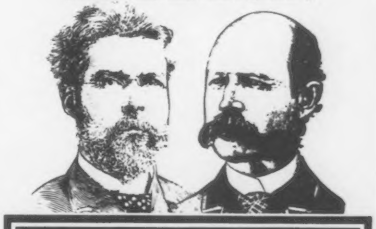

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My 5-Year-Old Knows Basic, continued...

Frustration is a natural part of almost every human experience almost every day. We are human and prone to err. A sign of behavioral maturity is the ability to persevere through frustration and try again. Too much frustration can exhaust our patience and build lasting negative attitudes and even a conditioned aversion to the source of the frustration. This is one reason why it is not a good idea to push children beyond their developmental capabilities.

Although computers can induce frustration, they can also help us to become more patient and understanding of our flaws. The concept of debugging should be taught to children even before they begin programming. Psychologically, it is extremely healthy to be able to own up to one's mistakes. In computer programming, mistakes are both normal and natural, just as they are in life, but we can change them faster and have more tolerance of them, thereby perceiving them as acceptable. Mistakes in computer programming also elicit help and cooperation from other children fostering peer help and support.

Children who are apt to respond to frustration with impulsive or destructive outbursts are not yet ready to use computers. A certain degree of autonomy and self-motivation is a desirable behavioral pre-requisite for computer experience. Children who are overly dependent on the teacher's attention are likely to become distracted very easily from computer tasks. Similarly, children must be able to reinforce themselves for their successes. Even though computers offer one kind of reinforcement in the form of feedback, praise for effort can help a child stick to a task that is becoming frustrating or difficult.

Summary

In summary, I have tried to present a basic outline of the ways children develop both intellectually and behaviorally. It is important to let a child work at his own speed and remember that not every child will take to computing, no matter how desirable a skill it is to learn. Understanding the child's cognitive abilities and experiential world can help us construct the most meaningful teaching experiences possible.

Most adults (including me) have to live with the feeling of being overwhelmed with responsibility daily, let's not make kids older than they are. Spare them the feeling of being overwhelmed until they're older—in today's fast-moving world that leaves them their freedom all the way up to the ripe old age of about 13. ☐

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Teach Your Kids Programming

Edward H. Carlson

Learning a programming language yourself is one thing. Helping your child learn programming is another. Although we are about seven years into the computer revolution, there is as yet little information to guide and assist parents in teaching programming to their children. This article discusses which concepts and facts are appropriate to be learned, points out some differences in the ways adults and children learn, and outlines methods that work in home teaching of programming. At the end is a list of programs and manuals that are helpful to children learning programming.

This article was born out of my recent experiences in helping organize and teach the "Computers and You" summer camp at Michigan State University (using Pets), writing Basic manuals for children in the age range 10 to 14 years, and more recently, working with Logo.

There has been a spate of courses recently to teach "computer literacy." I advocate going beyond literacy to actual competence in programming. The reasons are several, and the best exposition of them is given by Seymour Papert in his book *Mindstorms: Children, Computers and Powerful Ideas.* Much of what follows in this article is influenced by Papert's ideas and those of his mentor Piaget. I urge any adult interested in computing and children read *Mindstorms.*

Edward H. Carlson, Physics Department, Michigan State University, East Lansing, MI 48824.

Even very bright children under the age of 12 may be slow in mastering the more abstract parts of programming.

Procedures are the thing. Papert points out that up to now our culture has been relatively lean in opportunities for children to learn and practice with procedures. Perhaps the greatest change that computers will bring our society is the reversal of this state of affairs.

Procedures in programming are named, broken down into steps, modified, arranged in hierarchical calling sequences, found to be in error (often!), and debugged. They perform a wide variety of functions: games, graphics displays, robot control, sound, speech and music. By contrast, the procedures learned in traditional schooling are typified by long division in arithmetic. They are often learned by rote, and cannot easily be manipulated or experimented with by the student.

The impact made by computing is enhanced by a process called "syntonic learning" by Papert. It involves the transfer or modeling of ideas from some familiar domain of activity to a more abstract domain. The mechanical turtle was invented to give young children a concrete object to manipulate with their programs. Graphics turtles on the screen serve the same purpose.

Another impact that computers can have on children does not involve programming at all. It is the freedom from drudgery that word processors give children learning to write compositions. Since much of the labor of text revision is removed, children can be more critical of the content and mode of presentation of their thoughts.

Choosing a programming language for your child to learn involves several factors: the age of the child, which computer is available, cost of software, and social questions such as what local schools, the child's friends and so forth are doing.

Logo has been designed to be an easy entry language for children. Its turtle graphics, simple syntax, and emphasis on procedure calling are all valuable features. However, its lisp-like "tree" structure is quite different from the Basic, Fortran, and assembly language grouping.

Because it is still by far the most widely used language for micro-

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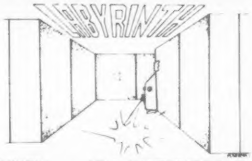

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Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC. Now available for TI99.

TREK ADVENTURE by Bob Retelle — This one takes place aboard a familiar starship and is a must for trekkies. The problem is a familiar one — The ship is in a "decaying orbit" (the Captain never could learn to park!) and the engines are out (You would think that in all those years, they would have learned to build some that didn't die once a week). Your options are to start the engine, save the ship, get off the ship, or die. Good Luck.

Authors note to players — I wrote this one with a concordance in hand. It is very accurate — and a lot of fun. It was nice to wander around the ship instead of watching it on T.V.

DERELICT by Rodger Olsen and Bob Anderson — For Wealth and Glory, you have to ransack a thousand year old space ship. You'll have to learn to speak their language and operate the machinery they left behind. The hardest problem of all is to live through it.

Authors note to players — This adventure is the new winner in the "Toughest Adventure at Aardvark Sweepstakes". Our most difficult problem in writing the adventure was to keep it logical and realistic. There are no irrational traps and sudden senseless deaths in Derelict. This ship was designed to be perfectly safe for its' builders. It just happens to be deadly to alien invaders like you.

Dungeons of Death — Just for the 16k TRS-80 COLOR, this is the first D&D type game good enough to qualify at Aardvark. This is serious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quest. Played on an on-screen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. At the normal price for an Adventure ($14.95 tape, $19.95 disk), this is a giveaway.

PYRAMID by Rodger Olsen — This is one of our toughest Adventures. Average time through the Pyramid is 50 to 70 hours. The old boys who built this Pyramid did not mean for it to be ransacked by people like you.

Authors note to players — This is a very entertaining and very tough adventure. I left clues everywhere but came up with some ingenous problems. This one has captivated people so much that I get calls daily from as far away as New Zealand and France from bleary eyed people who are stuck in the Pyramid and desperate for more clues.

MARS by Rodger Olsen — Your ship crashed on the Red Planet and you have to get home. You will have to explore a Martian city, repair your ship and deal with possibly hostile aliens to get home again.

Authors note to players — This is highly recommended as a first adventure. It is in no way simple—playing time normally runs from 30 to 50 hours — but it is constructed in a more "open" manner to let you try out adventuring and get used to the game before you hit the really tough problems.

QUEST by Bob Retelle and Rodger Olsen — THIS IS DIFFERENT FROM ALL THE OTHER GAMES OF ADVENTURE!!!! It is played on a computer generated map of Alesia. You lead a small band of adventurers on a mission to conquer the Citadel of Moorlock. You have to build an army and then arm and feed them by combat, bargaining, exploration of ruins and temples, and outright banditry. The game takes 2 to 5 hours to play and is different each time. The TRS-80 Color version has nice visual effects and sound. Not available on OSI. This is the most popular game we have ever published.

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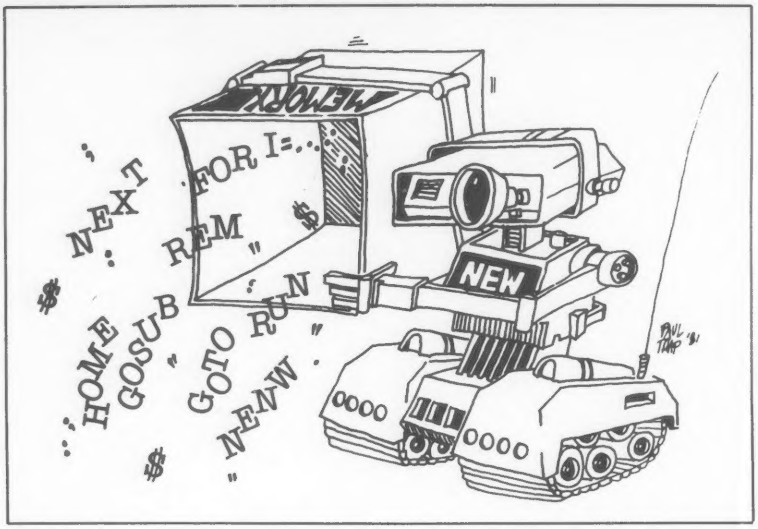


Figure 1. The NEW *command. Visual and verbal metaphors are a strong crutch to remembering the meaning of the Basic commands and to understanding concepts.(© Datamost)*

computers, I will concentrate on the teaching of Basic to children. However, much of what I say has broader implications for children and learning.

The Children

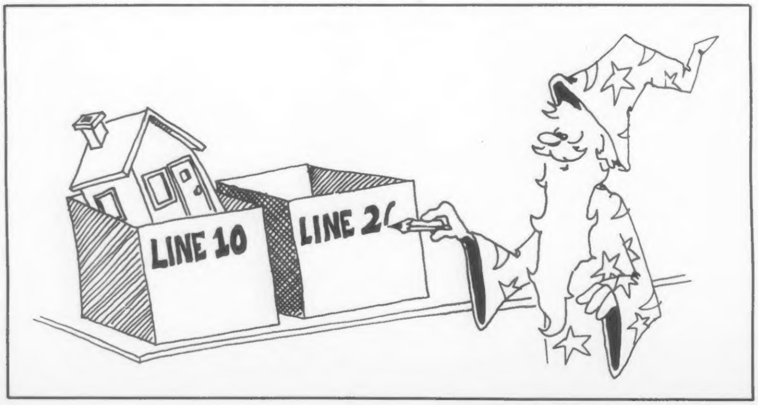
One should adjust teaching methods and goals to the development age of the child. Here are some guidelines:

Toddler through second grade. You cannot depend on reading or arithmetic skills. The children may start with "one finger" turtle graphics (Logo or the Nibble program) and advance to procedures and true programming as seems appropriate.

Grades 3 through 6. These students have adequate reading and arithmetic skills, but verbal teaching and hands-on trials are the most important modes for learning. The abstract reasoning ability of children in this age group is relatively undeveloped. The book by Larsen (described later) is at the right level.

Grades 7 through 9. At about age 12, children have finished a growth spurt in abstract reasoning. From here on, learning adult level programming is feasible. However, the methods that children bring to learning are different from those of adults, and adult level manuals are rarely suitable for them.

Figure 2. The shelf of boxes metaphor for memory is often mentioned in textbooks. However, it should not only be mentioned, but used completely and consistently for long enough to make it habitual for the student.(© Datamost)



Grades 10 through 12. Adult texts and teaching methods may be used. Students still have a relatively small kit of models of the world with which to generate programming ideas.

These guidelines are approximate, and individual children vary considerably. However, even very bright children under the age of 12 may be slow in mastering the more abstract parts of programming, and it is unwise to push them beyond their current interests and abilities.

Differences Between Children and Adults

The little people have their own way of getting along in the world. Following are some differences that one notices between children and adults. Of course, everyone, adult and child alike, really falls somewhere between the extremes described here.

The child: holistic, practical, easily swamped by details.

The adult: understands by mastering the details, mastering relationships between details, and arriving at a theoretical model of the situation.

The child: relatively inexperienced, few models of the world.

The adult: has many models and looks for similarities to past experiences.

The child: slow at typing and prone to giving up when boring portions of the task need doing.

The adult: Better typing skills, and tolerant of boring tasks.

Naturally, being adults ourselves, we feel that our duty lies in helping the child to become like us. However, you and your child will be more successful if you allow him to approach programming in his own style.

What Exactly Is Programming?

There are some interesting misconceptions about programming. Most people think it is similar to mathematics. In fact, it often turns out that way only because the adults most interested in programming typically are skilled in math. But the child is not usually skilled in math. He may be skilled in arithmetic, but there are children's activities that come much closer to programming than does arithmetic.

One of these is playing with building blocks. Just as a bag full of blocks has many copies of a relatively small number of standard sizes and shapes, a Basic program uses a small set of standardized commands. Yet in each case, an intricate and original structure can be built. Creativity rarely shows up at the individual unit level (a new use of the triangle block). It shows more often in combinations using a few units (certain ways of building walls or tower bases)

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and most often at the large scale (a unique and imaginative castle built from the blocks).

Writing is a familiar school activity that forms a model for programming. Writing a one page theme on "What I Like About Springtime" involves organizing your thoughts on several scales, from the topic as a whole down to paragraph and sentence levels. Finally, spelling, grammar and punctuation must be correct. The analogy to writing a Basic program is very close.

And what about arithmetic? To the extent that it is drill on arithmetic facts and memorization of procedures such as the addition of fractions, it is not very similar to programming. Of course, programs usually use some arithmetic: for example to place dots on the screen in building a picture. And story problems in arithmetic (which children usually find very hard) require skills in problem solving that are also required in writing programs.

Teach These Concepts

Children have the most trouble learning concepts. (They pick up the syntax and commands at a reasonable rate.) A good manual presents the teacher with a list of concepts that should be mastered, arranged in the order in which the material is presented. Here is such a list, followed by comments, and tuned up for Microsoft Basic.

1. What you see on the screen is not what is in memory.
2. Memory. Think of it as a shelf of boxes. Each box has a label on the front and the value of the variable inside.
3. The boxes are of three kinds, lines (of the program), string variables, numerical variables.
4. A program is a list of commands performed in order.
5. The immediate mode and the run mode.
6. Variable naming, single letter names first.
7. Flow of control.
   GOTO . . .
   timing loop
   FOR . . . NEXT
   IF . . . THEN all on one line
   IF . . . THEN branching to another line
8. Screen graphics. Cartesian coordinates.
9. Subroutines and "mind size bites."
10. Task organization: initialization; instructions and prompts; main loop: calls subroutines; finish and graceful exit of program.
11. Format of a Basic program.
12. Debugging is a natural part of programming, and should be done in an organized way.

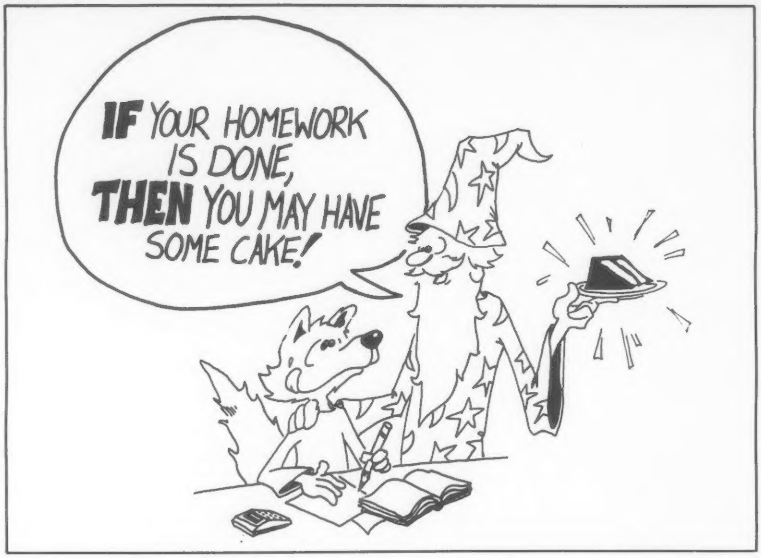
IF YOUR HOMEWORK IS DONE, THEN YOU MAY HAVE SOME CAKE!

Figure 3. Young students find the IF . . . THEN *construction a difficult concept to grasp. there are two metaphors. The verbal one guided the designers of the Basic language in their choice of words.(© Datamost)*

Comments On The Concepts

The box metaphor applied to memory is very powerful and should be referred to at every opportunity. For younger children, a set of similar cartons (e.g. the bottoms of cardboard quart milk cartons) can be used to illustrate the process with a few short sample programs. Each carton has a label on the front, and the contents are program lines (during the program writing phase) or variable values (during the running of the program). Write the name of the variable (or the line number) on the label, then put a scrap of paper with the value of the variable (or the Basic line) in the box.

The box metaphor applied to memory is very powerful and should be referred to at every opportunity.

Children enjoy seeing the "real boxes" in the computer. Show them the memory chips in the computer, stressing that each contains thousands of boxes. Better, get an EPROM with its transparent window revealing the chip and a powerful magnifying glass, and show them the rows of boxes. Of course, even under magnification, imagination is required to resolve the gates (boxes) in their rows.

The immediate mode has several other names: edit mode, calculator mode, etc. This is where it is better to avoid over explanation. The child's natural holistic and practical approach will succeed in keeping the immediate mode and the run mode separate. You need only keep an eye on things and straighten out any confusion.

Variable names are best kept to a single letter. Doing so means less typing, and in short programs there is little need for longer names. The Microsoft naming conventions that only the first two letters count and that embedded reserved words must be avoided create quite a potent source of error and confusion when using longer names.

For the most part, the order in which Basic commands are taught is not too critical. A good manual will introduce commands in such an order that interesting (but short) programs can be written right away. However the "flow of control" commands are very abstract and must be introduced slowly and with care. The order shown above works well.

GOTO . . . is an easy introduction to the notion that the orderly flow of control down the program listing can be interrupted. The timing loop is next presented as a unit, without explaining its structure:

```
30 FOR T = 1 to 1000:NEXT
```

Tell the little squirmers that the computer is "it" in a game of tag, and is counting to 1000 before going on with the program. This timing loop is good for slowing programs down enough to see what is happening.

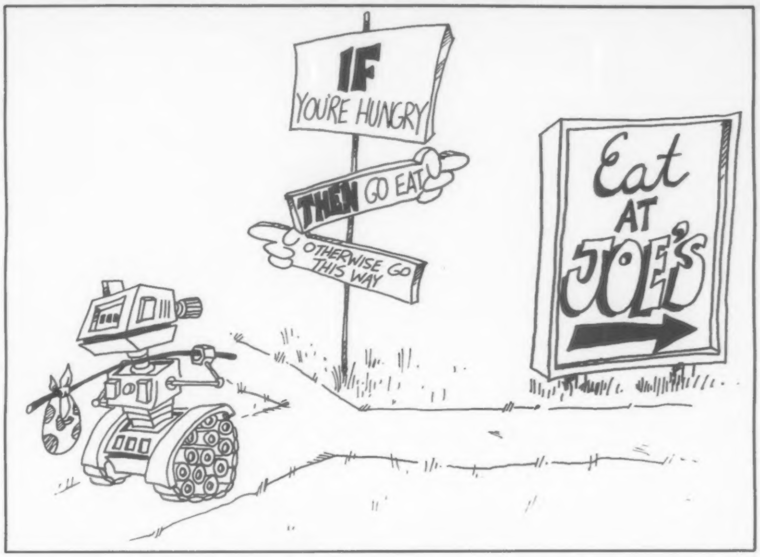

Figure 4. The fork in the road metaphor for the IF . . . THEN *construction. This visual metaphor sees the program listing as a map and is especially important in complicated programs. You should draw lines for flow of control on listings, e.g. from* GOTO *statements to where they "goto," to help the student visualize the road map. (© Datamost)*

Next, tell them that the computer can do other things while counting, and introduce the full FOR . . . NEXT loop—slowly.

The conditional, IF . . . THEN, is a very hard concept. Use two metaphors, one visual, the other verbal, to explain it. Examples are given in Figures 3 and 4. First teach IF . . . THEN in which only a single command (not a GOTO)) follows the THEN. Let this digest for a few lessons, then show the use of IF . . . THEN to make larger loops (by using GOTO . . . after the THEN).

Teaching Advanced Concepts

We have come to a natural break in the topics covered. The lessons up to this point have concerned individual commands and simple combinations of them. The programs have been short (up to about 10 lines), yet they can do interesting things both in graphics and in verbal play.

Now the student will attempt larger projects and learn more commands and the fine points about how to handle strings and screen graphics. But it is important to continue teaching the larger aspects of the art of programming. These include task organization and debugging techniques.

The hierarchical organization of a program is made easier by programming from a template. When starting a new program, a standard format is loaded, then filled in. Such a format is given in Listing 1.

Techniques Of Teaching

The following are some rules and procedures that are valuable for teaching children regardless of age.

Preparing Yourself

Buy a good manual written for children the age of your child. If it is written for your brand of computer, great. If it isn't, go through it and change the text to match your computer.

Don't start by teaching arithmetic on the computer.

An alternative, if you are proficient in Basic yourself, is to spend a few minutes examining the list of commands, statements, and functions in your version of Basic, dividing them into two classes: early and late. Put the early ones in some order that seems reasonable for teaching. The order is really not critical after the first few commands, but should follow some rational scheme of teaching strings, graphics, and arithmetic commands. The first few commands in the list should be PRINT, RUN, LIST, NEW, REM, INPUT, and GOTO. Group them in sets of three to five. Each set will be one lesson.

Don't start by teaching arithmetic on the computer. It is deadly dull, even for children who find arithmetic easy. Wait until some program requires a little calculation, then start putting it in.

There is a natural tendency to just "teach the commands." They are so visible. But you must take pains also to teach the concepts, the control structures, and the data types. So identify the concepts to be taught, and then teach them actively, not just letting them trickle down by osmosis.

Look at the list of concepts I gave above. Fold them into the lessons at a slow rate. For children under 12, taper off on the speed with which concepts after GOTO are presented, and "water down" the concepts to boot.

You don't have to be dogmatic about the concepts. Just introduce them informally, matter-of-factly, and at a measured rate.

Interacting With Your Child

How formal should the lessons be? For you, the teacher, the list of topics is complete and well ordered. The extent to which the child does formal lessons with assignments to learn and exercises to do is another matter. Suit the format to the situation in your home.

Your child will need a great deal of over-the-shoulder help for the first hour or so. After that, keep in contact, presenting new ideas and checking the progress of your student against your list of topics. This can be done very informally, but don't assume that the child has covered the ground completely. Check him out!

The learning process should be child driven. Whether you prefer to "let the child play around and discover things" or want to provide more visible guidance, there will be no success unless the child enjoys creating and learning. That means that the subjects of the programs and the techniques used must be one that the child has chosen, either by himself or from a list of suggestions provided by you.

All of your success will depend on keeping programming fun. Several techniques that help in this involve some homework on your part.

First, you can show him programs that you have started and invite the child to complete, alter, or extend them. This alleviates much of the drudgery and focuses attention on new material.

Second, use graphics early and often. Younger children may want to spend a lot of time just drawing when first shown how. This is fine. It develops confidence and keyboard skills, and allows you to introduce line editing to the extent supported by your computer. Wean the student from pure graphics by helping him develop moving graphics.

Listing 1. Standard Format For Basic Programs.

```
1   GOTO 2000: REM              PROGRAM NAME
2 :
3   REM     LINES 2 THROUGH 99 ARE FOR "SENSITIVE" SUBROUTINES
4   REM     THAT ARE USED OFTEN OR DEEPLY NESTED AND MUST RUN FAST.
97 :
98  REM     =========================================================
99 :
100  REM    MAIN LOOP
101 :
110  REM    THE MAIN LOOP CALLS SUBROUTINES AS NEEDED.
195 :
196  END
197 :
198  REM    =========================================================
199 :
200  REM    FIRST SUBROUTINE NAME
201 :
202  REM    PUT ORDINARY SUBROUTINES HERE, STARTING EACH WITH
203  REM    NEW EVEN-HUNDREDS LINE NUMBERS.
204 :
295  RETURN
299 :
300  REM    SECOND SUBROUTINE NAME
301 :
395  RETURN
1000 :
1008  REM   ****************************************************
1009  REM   *                                                  *
1010  REM   *                  PROGRAM NAME                    *
1011  REM   *                                                  *
1015  REM   *             AUTHOR, ADDRESS, PHONE               *
1020  REM   *                                                  *
1025  REM   ****************************************************
1031 :
1100  REM   DESCRIPTION OF THE PROGRAM AND VARIABLES
1110 :
1990  REM   =====================================================
1995 :
2000  REM   INITIALIZATION
2001 :
2010  REM   PUT LINES HERE THAT INITIALIZE AND DIMENSION VARIABLES,
2015  REM   AND GIVE THE INSTRUCTIONS AND THE STARTING MENUS.
2020 :
2990  GOTO 100: REM     JUMP TO THE MAIN LOOP
2994 :
2995  REM   =====================================================
2999 :
3000  REM   SUBROUTINES
3001 :
3010  REM   PUT "ONE TIME USE" SUBROUTINES HERE
9000 :
9001  REM   =====================================================
9002 :
9010  REM   PUT UTILITY SUBROUTINES HERE.  AS YOU WRITE THESE, SAVE
9015  REM   THEM SEPARATELY, AND USE UNIQUE LINE NUMBERS, SO YOU
9020  REM   CAN ALWAYS ADD THEM TO ANY PROGRAM WITHOUT LINE NUMBER
9022  REM   CONFLICT.  USE TEXT FILES: SEE "CAPTURE" IN DOS MANUAL.
9025  REM   SAVE ONE LETTER, FOR EXAMPLE Z, TO USE AS
9030  REM   THE FIRST LETTER OF ALL VARIABLES IN THESE ROUTINES.
9035  REM   THIS IS A "FIX" FOR THE LACK OF LOCAL VARIABLES
9040  REM   IN BASIC.
9999 :
```

This format should be put on disk or tape and read in before starting a new program. Children can be introduced to this format after considerable experience with Basic, and when they start writing long programs.

Using a standard format helps you remember which elements will be needed in a program (initialization, descriptions, standard utility subroutines, main loop, and subroutines). It saves time in putting in such prompts as the author's name, address, and phone number in its pretty box. It also helps in adding standard subroutines to your programs by reserving the line numbers where they will go.

Finally, this particular format puts the most used subroutines at the beginning, which is important in writing fast programs, and puts the initialization part last where there is lots of room. There is a tendency for initialization routines to expand as user-friendly items are added after the program first runs satisfactorily.

This surely will lead to full fledged programming.

Likewise, strings can be great fun, allowing word play, silliness and mock insults, and introducing a social aspect to computing. Print them at odd spots on the screen, with delays, inverted or flashing letters, or sliding along under the direction of a loop. Include whatever other bells and whistles your computer supports, such as sound.

Periodically, sit at the computer with your child and run through your checklist of commands and concepts to see where the holes in his mastery lie. Then gently guide the child to start filling them in, whether they be just details of syntax or command usage, or whether they be overall organizational concepts.

Strings can be great fun, allowing word play, silliness and mock insults, and introducing a social aspect to computing.

A conscientious implementation of this program will require a great deal of time and effort. Just remember that the purpose of a good Basic manual is to do much of the work for you. It is not that the author knows Basic better than you do, but that he has done the preliminary organization of material and chosen examples and assignments that the child may appreciate. This still leaves you with the responsibility to help and support the student, and to check that the material is being mastered without large gaps.

So let's go on and examine some of the workbooks and programs that are available for helping children learn programming.

Books for Kids

The following list includes some books for teaching Basic to children. All are in 8 x 11 format.

Computers for Kids by Sally Greenwood Larsen is published by Creative Computing Press. There are versions for the TRS-80, Apple, Atari, Vic-20 and Timex 1000/Sinclair ZX81. It uses large type and a language style appropriate for about the third or fourth grade. It treats 25 of the most essential Basic commands and has a nice section on the use of graphics. Ms. Larsen includes some sample programs, help in the mechanics of keyboard editing and disk drive use, and useful tips about teaching computer programming in the classroom. The sec-

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tion on making flow charts is delightful. Seventy-three pages.

Kids And The Apple by Edward H. Carlson. Modesty prevents me presenting a subjective description of the book. Intended for use at home by children aged 10 through 14, it can also be used in classroom teaching. It has over 200 pages and 100 cartoons and treats about 50 Basic commands. There are 33 lessons. Each is preceded by one page of Instructor Notes which outlines the concepts being taught, lists some pitfalls in the subject, and gives some short quiz questions to be used when the lesson has been studied by the student. Each lesson describes the material in language at about the fifth or sixth grade level and has several assignments at the end. For each assignment there is a solution in the back of the book. Some of the solutions were done by children who tried out the book in manuscript form. Published by Datamost in 1982, it is spiral bound to lie flat at the work station.

Teaching Basic Bit By Bit is edited by Batya Friedman and Twila Slesnick and published by the Lawrence Hall of Science, University of California. This is a sparse but imaginative eight-day curriculum for ages 11 through adult. It supposes classroom use.

Introduction To Applesoft Basic—Student Text is published by the Minnesota Educational Computing Consortium. I have not yet seen this book.

Basic Discoveries by Linda Malone and Jerry Johnson is published by Creative Publications. It has 71 pages and treats 10 Basic commands. Its explanations are on the adult level, but its many exercises and solutions are intended for children in the fourth grade and above. One version for all computer makes.

A series of books called *Creative Programming for Young Minds* by Henry A. Taitt, published by Creative Programming, Inc. has versions for several different computers and several levels of ability.

I Speak Basic To My Apple by Aubrey B. Jones is published by Hayden Book Company. A classroom set, containing a teacher's manual, 20 copies of the text book, and masters for 14 quizzes is available. The text was developed in a middle school program for encouraging students to prepare for an engineering career. It has about 240 pages and a distinctive page format. Each page is devoted to one topic, even if it means that the page may be mostly empty. Large, bold, easy-to-read type allows concentration on the material.

Programs That Help

These programs do not teach Basic but help children learn programming in various other ways.

Helter Skelter by Dynacomp Inc. The Apple version is available and other versions are in preparation. This is a lively program in color and sound that kids from toddler to second grade will enjoy. It not only arouses their interest in the computer and entertains them, but helps them learn pre-school material with Sesame Street type antics.

Antfarm by Jacques LaFrance, published by WIMS Computer Consulting. This system helps children write little programs to control an ant farm in a special tiny language. The ants move, plant, and eat. The ants may starve if they do not find food, but finding food is easy to arrange if you think ahead. The plants need some time to grow from seeds through several stages to harvest size. The graphics, which are punctuation marks rather than lo or hi resolution figures are in black and white, and rather slow.

A turtle graphics system has a "turtle" (a cursor shaped like a triangle) that moves and turns upon command and can draw a line as it travels. It is a means of creating line pictures under control of simple commands. It is most valuable when a program can be written to control the turtle. The Logo language available for the Apple and the Texas Instruments computers has a turtle system built in. Apple Pascal also has a set of turtle commands, and programs can be written in Basic for making turtles. One such for the Apple was written by David Krathwohl and published in *Nibble* Vol. 3, No.1. It is available from Nibble on disk. Another, by Al Evans, appeared in the July, 1982 issue of *Creative Computing*. There are turtle graphics available now with the Atari Pilot cartridge.

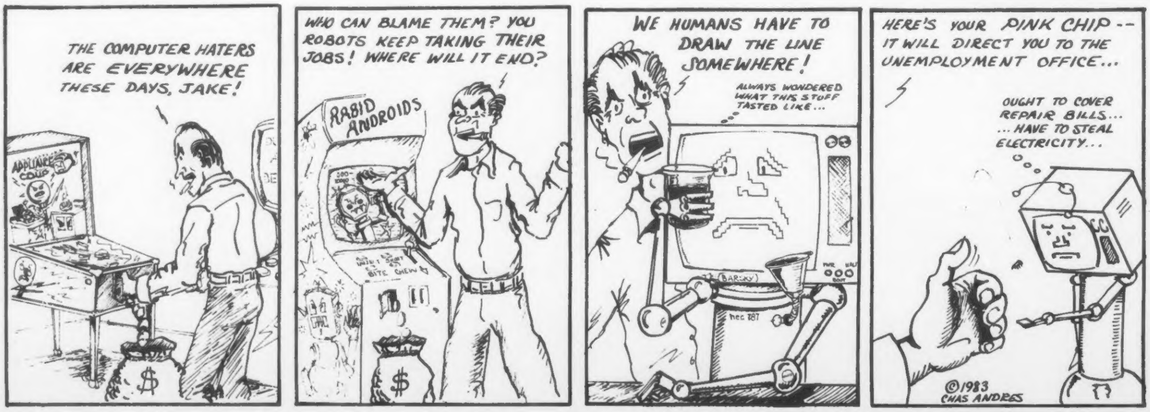
The advantage of a turtle is that the child can easily control a visible object and thereby learn the essential features of programming: that procedures are a sequence of steps, that debugging is a necessary and natural part of creativity, and that branching and loops are powerful tools.

Robotwar is a program published by Muse Software, Inc. for the Apple. It, too, requires one to write programs which control a robot in a battle in a special tiny language. However, the system is rather complex, involving an operating system, a compiler for the language, a test bench for trying your programs and finally, a battle with a set of robots selected from an arsenal. However, the idea can be very captivating for kids in the 12 and above age range and may be just the motivation they need to learn programming.

The cartoons in this article were drawn by Paul Trap and are from the book *Kids And The Apple*. They are copyright Datamost. ☐

Bit Pit

Chas Andres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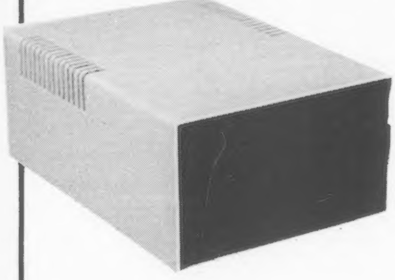

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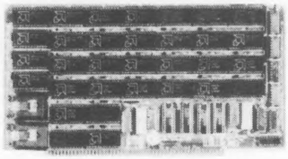

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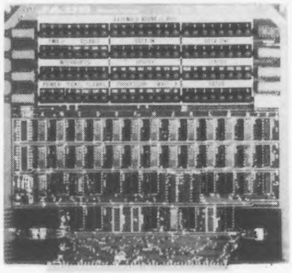

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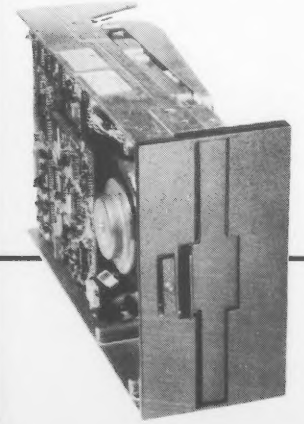

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Learning To Learn By Learning To Play

Marc D. Stowbridge and Peter Kugel

Computer games have been used for many purposes. They have been used to entertain, to teach students traditional school subjects like arithmetic and spelling, and to help students become comfortable with computers. In a course recently given by one of us (Marc) at Boston College, computer games were used to teach students something they are seldom taught in courses: how to learn. We thought that by teaching students *how* to learn instead of teaching them *what* to learn, we might be able to help them get more out of school.

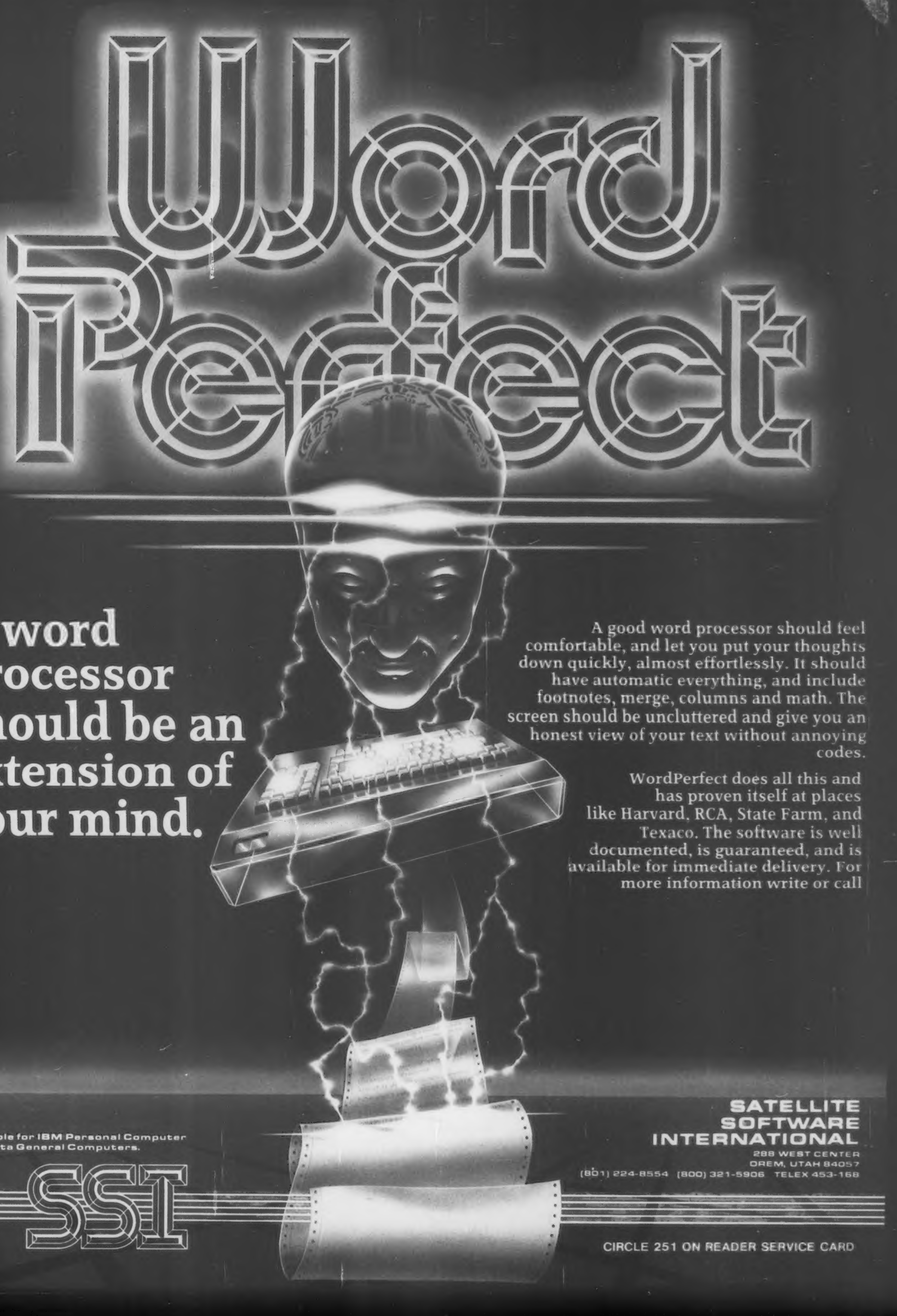
We hoped that by asking them to think about how they were learning (or failing to learn) in the rather simple rule-governed environment that games provide, we might help them to discover better strategies for learning. In other words, we hoped to help them to learn how to learn.

But, since we were fairly sure that they would think that they had only learned to play games, we then asked them to apply what they had learned by playing to the job of learning something more "serious"—namely computer programming. And we hoped that they would then realize that the ideas that they had gotten from learning to play could be used in their other courses too. We know that some of them got the point.

The course has been given several times to several different types of students. Last summer, for example, it was given to 40 "high-risk" freshmen who had been admitted to Boston College in spite of relatively weak academic records. Although most of these students had not learned what most students have learned before they go to college, they appeared to have the underlying ability to learn those things. During the summer, other efforts were being made to teach them the things that they had missed in traditional "remedial" classes. But we felt that it was at least possible that some of these students simply did not know how to learn in a classroom situation. We felt that if they could learn to learn they might be better able to learn, not only the things that they had missed, but also the new things that would be presented in their college courses.

Computer games have some advantages over traditional games for teaching

Professor Peter Kugel, Chairman, Computer Science Dept., Boston College, Chestnut Hill, MA 02167.



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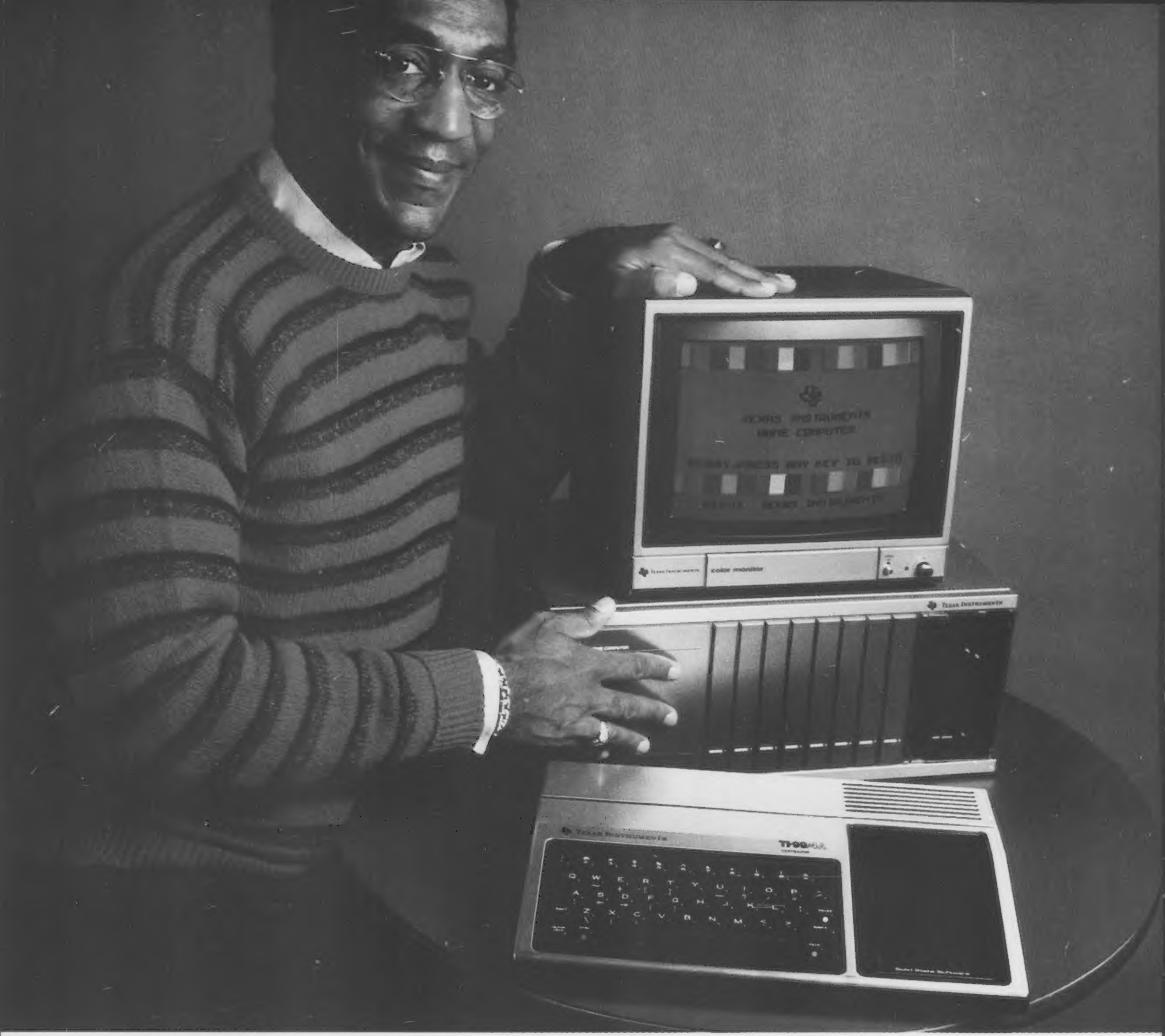

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CIRCLE 295 ON READER SERVICE CARD

purposes. One is that they can be played in such a way that each player has complete control over the game. The computer always follows the same program and there are no other people involved who can "take over" the work. Another merit of computer games is that the computer is very strict (but very impersonal and non-threatening) in following the rules. And finally, the computer will play tirelessly, thus freeing the teacher from having to run (or even to play) the games.

Adapting the course to other situations should be easy. The underlying ideas seem to us to be adaptable to other student levels, other computers, other schools, and other teachers whose ideas about what constitutes good learning procedures may be different from ours. Much of the students' work was with computers which allowed quick correction of student errors without requiring a large amount of grading on the part of the teacher. Many of the programs required for the course already exist; good games are available for most computers.

The course was based on four fundamental ideas:

1. Students can improve their ability to learn by thinking about what they are doing when they try to learn and by discussing what they do with others.
2. Such thinking and talking about learning is best done while the students are actually trying to learn some particular thing, rather than through abstract discussions or lectures about general principles.
3. The process of learning to play (and win) computer games provides an excellent sample learning process for this purpose for several reasons:
   - Games involve quite precise rules that—particularly in computer games—cannot be easily violated.
   - Students are much more relaxed about learning to play games than they are about learning traditional school subjects.
   - Students like games and readily accept the value of learning to play and learning to win. (Many students do not readily accept the value of traditional school subjects.)
4. What students learn about learning by learning to play can be transferred to the process of learning other things if one pays attention to the transfer process and does not assume that it will happen automatically.

Not Knowing How To Learn

Some students seem to know what to do in school and some do not. One can argue that the differences between those who do well in school and those who do not are innate and hence unchangeable. To some degree, this is almost certainly true but we feel that it may not be quite as true as some people think it is.

Suppose that you believed (as we do) that learning is something that the learner *does*, that a learner is not just a passive sponge who sits in one place and absorbs information. Successful learning would then depend, at least in part, on *doing* the right things.

Virtually every human being seems to be born "knowing" how to learn certain things. Everyone learns to recognize his mother, to nurse properly, to walk, and to talk. Such learning is accomplished with little visible effort on the part of the learner. We seem to be born with built-in "programs" that we follow to learn these things.

The ability to learn in school, however, seems rather less evenly distributed among us. Some children enter school seeming to know what to do. Others don't.

Some students seem to know what to do in school and some do not.

The ability to learn in school might be innate, but suppose it is not. Suppose it must be learned. Imagine, now, that you are arriving on your first day of school without having learned it. If you are one of those people to whom school learning came naturally (and chances are that you are) this may be hard for you to do. But try. Here you are. The teacher does something. You do something in response but it is the wrong thing. (You haven't learned the right thing to do, remember?)

You start out enthusiastic and work hard. Your teacher notices that you still aren't learning. Perhaps you need to be taught more slowly. That doesn't work. Your teacher concludes you lack ability. You get discouraged. Nothing you do works, so you decide you don't like school. That continues for years without anybody realizing that all that is "wrong" with you is that you don't know how to learn in school.

Why doesn't somebody teach you? One reason might be that nobody knows what the problem is. But there are other reasons. One is that many people don't believe that learning can be taught. Another is that even if you believe that learning can be taught, it is not obvious how to teach it. After all, you want to teach it to people who don't know how to learn reading, writing and arithmetic. So how are they going to learn learning?

Here's an idea. Suppose that you try to let people learn to learn the same way they learned to speak their native language. You simply plunk them into a learning situation simple enough for them to handle and let them learn. For this to work, you need to pick something that people have an innate ability to learn. How about playing games? Children (and adults) seem to have a built-in ability to learn to play games.

You could, of course, teach games the way you teach languages in school, and students would probably have the same difficulties. A wag once suggested that if you really wanted to kill baseball in America, all that you would have to do would be to teach baseball in school. But that is not what we did with games in our course. We gave students a few hints and some written instructions and let them figure out how to play on their own.

Learning To Play

In each session, students were told a bit about a game, and sent off to play. They were asked to:

- Learn to play legally—learn the rules.
- Learn to win—develop good strategies.

While they were at the computer, they were asked to take notes about what was happening and to keep the printout. Then, when they came back to the next meeting, the class discussed what did and did not work.

Some of the game programs we used were taken from David Ahl's book *Basic Computer Games*, and some were written especially for this course. The games chosen presented the students with problems of increasing difficulty so that their learning would be cumulative.

Students were guided through the course by a control program that performed various functions:

- It presented step-by-step instructions to the students, calling them by name (a feature that those of us who are familiar with computers tend to minimize but that is surprisingly important to the students).
- It sequenced the students through the material, keeping track of where a given student was and indicating to him where to go next.
- It provided the instructor with information about each student's status and progress.
- It kept the students away from the other resources of the computer.

The Curriculum

On the first day of class, students were given instructions for logging in (we used a time-shared PDP 11/70) and for running the control program called LTL (for Learning to Learn)[1].

The students took this material to the computer and tried (on the whole, successfully) to log on and off without help. If they ran into trouble and asked for help, it was given—sparingly.

They were asked to keep their printout and to keep detailed diaries of what happened. A typical entry in a student diary looked like this:

"The computer typed WHAT IS YOUR L.T.L. NUMBER? I looked at my instruction sheet and typed 501. I waited for a while.
The computer did not do anything. Then I remembered to type RETURN."

We asked the students to record not only their successes but also their mistakes. Most computer programmers recognize the value of making mistakes and learning from them. But surprisingly few students do. A great deal of elementary education seems aimed at disguising the value of making mistakes and correcting them. We emphasized it.

We felt that, if the students wrote down what they were doing and talked about it, they could not avoid thinking about it. Thinking about learning (like thinking about anything) gives you the opportunity to change the way you do it. That, supposedly, is one of the reasons for teaching philosophy and also the basis for many kinds of psychotherapy. Our feeling was that at least some of the students might have gotten trapped into unproductive learning behavior. Thinking about what they were doing gave them the chance to at least consider changing it when it did not work.

We also hoped to get them to "think about their own thinking." Our hope was that if they could think about their own thinking, it might occur to them to change it to adapt it to circumstances. A common problem in students is that, once they hit upon a successful way of working, they use it for everything. (As Abe Maslow once said "To the person who has only a hammer, the whole world looks like a nail.") We hoped to make them more flexible.

Guessing Numbers

At the end of the first class—in which we discussed both how they actually did log on and how they learned to log on—they were told to go back to the computer and play their first real game, NGuess, a simple and familiar game in which the computer picks a number between 1 and 100 and the player tries to guess it in 7 guesses or less.

The students were told to learn to play correctly, which is relatively easy but still raised problems for some. And they were told to find a good strategy.

Some students did not even try to play rationally. (They guessed the same number twice.) Others looked for, and found, an optimal strategy.

The program they used was more failsafe than most. Errors (such as O for 0) were trapped, and the student was given a chance to recover. Error comments were as clear as possible. Care here seems important if for no other reason than to raise student ambitions by making it possible for them to solve the problems.

A great deal of elementary education seems aimed at disguising the value of making mistakes and correcting them.

The second class meeting, during which they discussed their play of NGuess, set the pattern for the rest of the course. As problems were raised, they were written on the blackboard and an attempt was made to categorize the problems so that they could be dealt with individually. Problems that arose fell into four categories:

- Problems arising from a failure to remember what had been learned in the first session (on how to use the computer).
- Problems arising from difficulties in understanding the instructions for playing the game.
- Problems in following the rules, once one has figured out what they are.
- Problems arising from finding a good (or best) strategy.

No attempt was made to try to sell one approach to problems over another. It is our feeling that some students resist learning in school because they feel it violates their personal integrity to do what the teacher tells them to do. They feel they are giving in. Such students do better when allowed to use their own strategies. Furthermore, students understand better things they have framed in terms of their own intuitions than what has been framed in the intuitions of others.

One of the great merits of using computer games in this situation is that the computer will reward any approach that works. It need not be the approach that the programmer of the teacher had in mind when the game was presented. And this gives the student a feeling of confidence in himself.

Most students who found the optimal strategy for NGuess did so by thinking of the numbers arranged on a line and then thinking of their guesses as cutting

"We programmed it to answer consumer demands..."

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[1] The course was run under the auspices of the Learning to Learn program at Boston College, directed by Marcia Heiman and Dan Woods.

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CIRCLE 227 ON READER SERVICE CARD

the search area in half each time. This was interpreted to the class as an example of the value of trying to think of problems in terms of spatial images, of trying to look at problems in different ways while looking for solutions, and of using metaphors to better conceptualize (and remember) problems.

Many of the students in this course seemed to lack flexibility in their approach to problems. They would try one way to solve the problem and it would never occur to them to consider a different one. They would consider only two possibilities—either they had not worked hard enough on their one approach or it would not work and thus there was no possible solution to the problem.

The Other Games

After NGuess came a game called Flipflop. In this game, the player tries to turn a row of X's into O's by indicating which symbol in (say) a five-symbol row, is to be "flipped" (from O to X or X to O). The difficulty comes from the fact that, when a particular symbol is flipped, others may be flipped along with it. For example, if the student has reached OOXOO and tells the computer to flip the third symbol, the computer will flip the third symbol, but it might also flip the fifth as well, producing OOOOX. In this round of the game, the computer will always flip the fifth when told to flip the third. But it may do something quite different when asked to flip the fifth and it may do something else in the next round of the game.

There are several different strategies that can be used to win this game, but they all require a systematic recording of observations and testing (and extrapolating) alternative strategies. Other games used in the course (in order of appearance after Flipflop) were:

Blackjack, the familiar card game, also known as 21.

Word, in which players try to guess a five-letter word selected by the computer by guessing its letters one at a time. The computer tells them whether the letter guessed appears in the word and, if it appears, where it appears.

Mastermind, in which players try to break a code.

Star Trek, a popular computer game with relatively complex instructions and strategies.

Each game presented its own problems. Blackjack had instructions that were difficult to figure out—ordinarily an undesirable feature in a computer game—that gave the students a chance to figure out what to do when they could not understand what they read.

Mastermind suggested the idea that theories might be things that one could test by varying parameters one at a time so that, when something turned out not to work out, one knew what it was that was not working.

Star Trek was the most complex game of the group. Its instructions alone require four pages to print out. Good strategies for playing are rather complex, and this is a good game to teach the concept of "divide and conquer"—breaking problems into parts before trying to solve them. It was also a good place to point out that it does not always pay to discard a strategy simply because it does not work the first time. Before totally discarding an approach it sometimes pays to try to first improve (or debug) the approach to see if it can be saved.

A General Recipe

Toward the end of the game playing part of the course, an attempt was made to formulate a general strategy for solving learning problems as they arose. The hope was that, by providing a recipe to follow, one might be able to help the student's transfer strategies, learned from learning to play, to new areas. The purpose of a recipe (or a paradigm) like this one is to help the students' transfer strategies, learned from learning to play, to new areas. The purpose of a recipe (or a paradigm) like this one is to help a student figure out what to do next in new situations. It was suggested that thinking about what you do was appropriate whenever you faced a situation in which you wondered: "What do I do now?" We decided that you might do the following 3 things:

The idea of a "triggering" feeling that tells you when you can use the ideas learned is very important.

- Look around and see what you can find out about the situation. Gather all the information you can—from notes, from the instructor, from friends, and so forth. Then compare the situation you are in to others like it (possibly to situations that arose when you were learning to play computer games in this course) and try to see what you already know about this situation because it resembles others you have encountered.
- List your options. What exactly can you do? It pays to list the possibilities before you try them out. That way you are likely to come up with more alternatives.
- Try out each option in turn. If necessary, try it out "in your head" or on a piece of paper first. If a particular method does not work, try changing it slightly (debugging it) by thinking about why it might not be working. If it continues not to work try something else.

Most of this recipe is simple common sense—except that its use is really neither simple nor common.

We feel that a particularly important feature of this recipe is that it always starts in the same situation: you are wondering what to do next. The time to think about your thinking is always indicated by the same feeling—the feeling that you don't know what to do next. This can happen in a variety of circumstances, but it always feels the same, and hence, is easy to recognize.

When you do recognize it, you have two things to fall back on. One is your recipe and the other is your memories of specific things that worked for you (they may not be right for others) when you learned to play computer games. We feel that in a course like this, the idea of a "triggering" feeling that tells you when you can use the ideas learned, is very important if you want the ideas to transfer to other courses.

Learning To Do "Useful" Things

Our aim in having students play games was not to make Pac-Man experts. We were trying to make students better at learning things other than games. We wanted them to take what they learned from learning to play and apply it to their regular courses. The process by which one takes something learned in one area or course and uses it in another, different, area or course, is called "transfer."

It used to be widely felt that learning something like Latin or logic was good for students because it strengthened their minds and would help them in studying other subjects. But the mind is not exactly like the muscle that this analogy suggests. Learning to lift dumbells may help you learn to lift packing crates but learning to play games need not help you learn to solve calculus problems.

If you want transfer to occur, it helps to practice the actual process of transferring what you have learned by playing to something else. For this purpose, we spent the latter part of the course teaching students how to program computers. Programming is similar enough to game

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playing (and they both use the computer) that the transfer is fairly natural.

We have noticed that students today are relatively poor at using what they have learned in one class in another. One reason may be that they do not have much practice in such transfer. And one reason why they may not have much practice it that, because of the fragmentation of the modern curriculum, teachers cannot usually assume that their students share any skill that can be transferred.

This was different when Latin and logic were in their heyday. Everyone took them both, so teachers could regularly allude to them, thus giving their students practice with transfer. But this is no longer possible, which may be why Latin and logic no longer seem to work as well as they used to.

By including a bit of learning to program in this course, we could give the students practice with the transfer process because we could assume some things in the students' backgrounds that they shared (the material of the first part) and the transfer of which could be discussed.

The transfer seemed to work—at least when it was thus guided. The students did seem to learn programming more easily and more imaginatively than one would ordinarily expect from similar students.

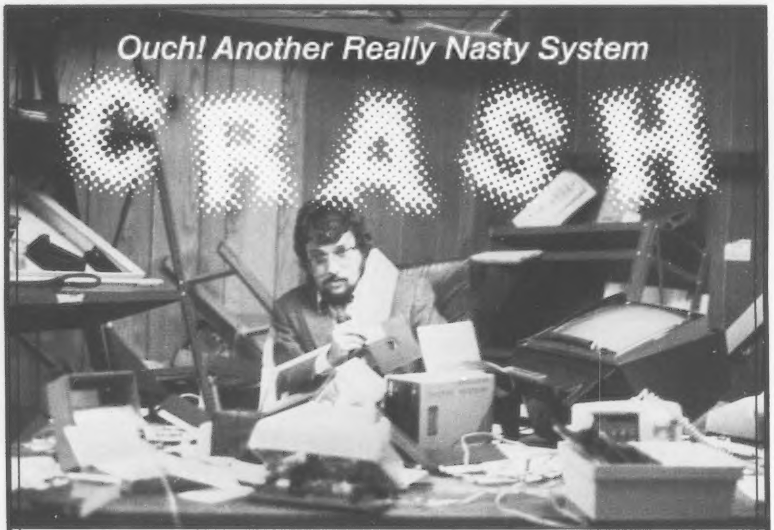
We do not know whether the ideas learned by playing games also tranferred to their other courses. But we have some fragmentary evidence that suggests that, at least in some cases, it did.

We are aware that it is easy to be fooled into believing in the success of one's own teaching methods. We do not think we were fooled but we cannot be sure.

However, the course was short. The effort was relatively small. The possible rewards are considerable. The course can be tailored to fit into virtually any curriculum. We feel that others might want to try this course with their own students. For such people, it may be helpful to summarize some of the main assumptions of the course as we see them and to list some of the things that someone who is trying to adapt this course to other situations might keep in mind:

- We assume that there is such a thing as learning to learn.
- Students who have learned to learn will do better in school than those who have not.
- Some students (but almost certainly not all) can learn how to learn by learning how to play computer games.
- In doing this, students should also learn to think about what they are doing as they learn. This will make them more flexible and it will enhance their ability to apply what they learn from learning to play to learning to do other, more useful, things.
- Such transfer is helped by giving them an explicit algorithm or recipe to use when they find that they do not know what to do next in a learning situation.
- And it is further helped by giving the students some practice in using what they have learned from playing in some other area.

Many students—perhaps most—do not do as well in school as they might. They are not as open to learning new things as they might be. This fact is discouraging to many people. We know that we have not discovered a cure for this situation that will work for all people in all situations. But for people who see this as a problem and wonder what they can do next, learning to learn by learning to play offers one possible answer. ☐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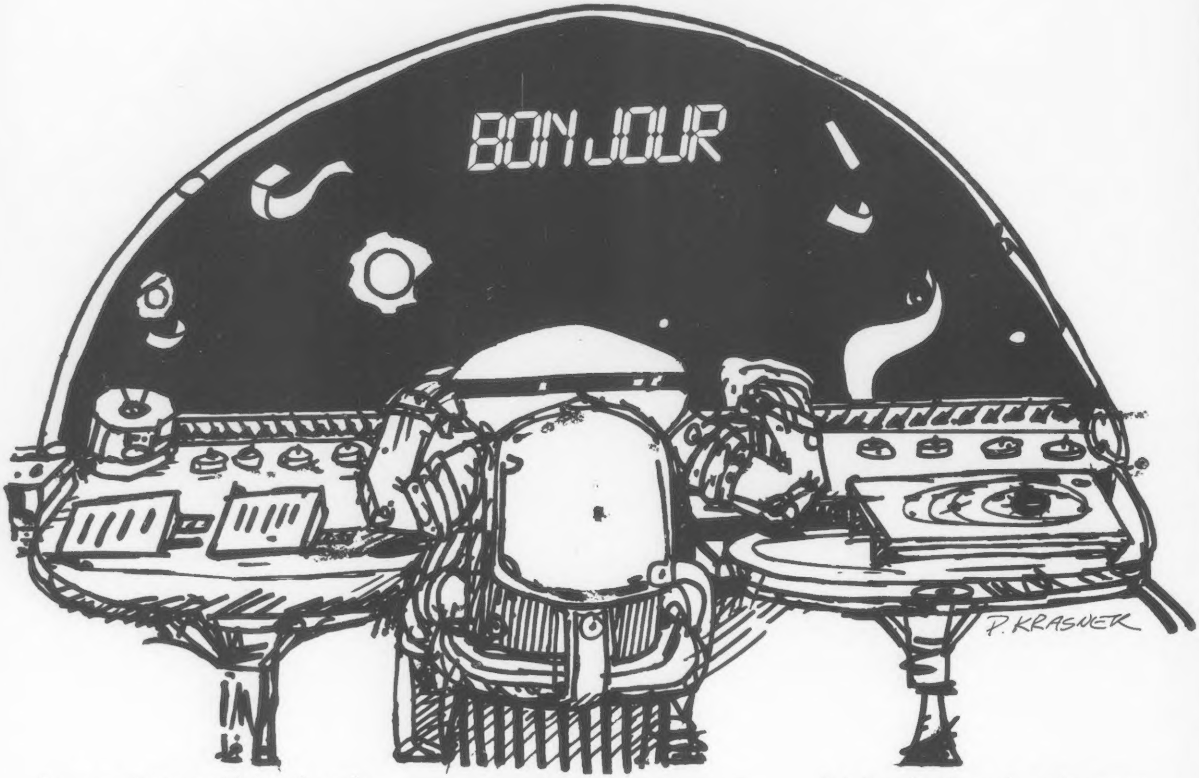

A. Allen Rowe

For now all you need know about the acronym CEGOLLE is that it is pronounced "Seagull" and defines a direction.

The need to define a direction came with the requirement to determine how to use computers in teaching foreign languages at the Air Force Academy. When the job landed on my desk, I was already overextended, as usual, fighting alligators instead of draining the swamp, putting out brush fires and in general applying all the principles of classical crisis management.

But with this job, instead of getting right to work I thought it over for a couple of minutes. The rest of this article describes my conclusions. I have tried to be brief and not altogether boring in their formulation. If you ever have to make a decision related to using computers in education, maybe they will save you some of that most precious of all resources—your own time.

A Case Against Computer Assisted Instruction

Computers compute quite well but they haven't met with much success in computer assisted instruction (CAI). The great tide of CAI enthusiasm, which crested in the early seventies, has subsided, leaving a few puddles of devotees scattered about. But the computer has not rewoven the fabric of education at any level nor in any field except, of course, in the teaching of computing.

But now, emboldened by the advent of cheaper, smaller machines, the computer faithful are orchestrating a CAI revival. Younger educators are flocking to hop on the wagon, committing with religious zeal considerable personal resources to the purchase and use of the most treacherous of all computers, the micro.

It is time for those of us who remember the first CAI fiasco to throw our full weight of experience and seniority into the defense of our unsuspecting junior colleagues who, like ourselves before, are ready to waste a good portion of their young lives and possibly gamble away their academic credibility on this CAI renaissance.

The weakest word in CAI is *instruction.* Instruction is teacher oriented and almost always institutional. But the microcomputer is not an institutional machine controlled by the educational computing oligarchy. It is democratic. It is subversive; it is already outflanking the old computer barons who made us feel like idiots because we didn't speak their arcane languages. It is the Model T of its time. You don't have to ride on somebody's train. You can get there on your own. In education, this means that the microcomputer will be a student-centered tool. Administrators may buy them for teachers to use, but, for a change, students will have a choice. If they are not learning on the instructors'

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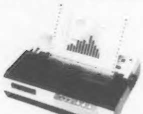

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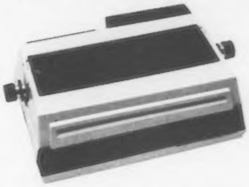

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machines, they can use their own. So scratch out *instruction* and put in *learning.*

Assisted is another weak word. A craftsman has a large choice of tools but chooses only those which enhance his skill. He does not use a sledge hammer to drive a finishing nail nor a penknife to cut timbers. If a tool does not help us do more with less faster and better, then it is not the right tool to use.

The computer is probably the most powerful tool ever developed, because it can be used to control numerous other tools. That doesn't mean it is always the best tool or that everything can be done better by machine. If the machine enhances the learning experience, use it. Never use it just for the sake of using a powerful tool. So scratch out *assisted* and write in *enchanced.*

The key is to make learning more fun than work.

Now we have a new acronym: CEL—Computer Enhanced Learning. Let's share it with our younger colleagues and together find out if CEL really holds more promise than CAI. But how do we handle the fact that for many of our learners, computers are inseparably related in their minds to all the computer video games with which they have grown up?

Kung Fu in the Classroom

In the West, the goal of the martial arts and of most applications of violence in general is to use one's own power to overcome the adversary and force him to do what you want. Even though we educators may have an occasional skirmish with administrators, our primary adversary is the student. He is the one we must coerce into learning what we teach. In typical western fashion, we employ all our skill, power, intelligence, and experience in the confrontation and sometimes win. In contrast, an Oriental warrior in the Kung Fu tradition will win by taking advantage of his adversary's strengths. We might win more often in education and with less strain on ourselves if we capitalized on our students' own strong points. One strength which almost all students, even poor ones, have in common is the desire to have fun: they are motivated, inventive, and even industrious when it comes to having a good time. They have no trouble distinguishing between what is fun and what is boring.

This skill greatly complicates our task, because *Sesame Street, 3-2-1 Contact,* et al. are tough acts to follow. Going from them to our classrooms is usually as enriching as switching from a stereo sound, full color extravaganza to an album of old daguerreotypes.

Of course, there are still students who would choose to read a book over watching TV or going to the movies. But they are probably a minority in most of our schools today. So if we structured our learning experiences to be full of sight, sound, motion, and maybe even touch and smell as well as essential content, we might not have to struggle quite so much. Rather we could let the majority of our young opponents pursue their hedonistic tendencies even at the risk of becoming educated.

The key here is to make learning more fun than work. Of course, a visitor from space would be unable to distinguish through observation between work and play in our society because, as important as the sensorial trappings of an activity may be, the essential difference is inside the mind. Some people fish for a living. Some people fish for fun. And there is very little overlap between the two groups.

Fun is something you do because you like doing it. Work is something you do for some other reason. Usually the external reward is the villain. As soon as somebody offers to buy those fish you have been catching and turning loose, the fun dynamic is in danger. And if that somebody tells you that from now on if you don't catch any fish you will be in big trouble; you immediately learn what it's like to be a working fisherman.

Now the nature of education in our society with all its external rewards and penalties ensures that our children become working students as soon as they enter the system, maybe even in kindergarten. By the time the survivors straggle into our universities, they have become accustomed to education that is not very interesting and often a little painful.

It shouldn't really be too hard to make our courses more fun than they have been before. Then maybe we could trick students into learning our subjects just as Big Bird conned them into learning numbers and the alphabet.

But Education is Serious Business

Of course, one can object to *Sesame Street.* After all, fun is frivolous, education is serious, and never the twain shall meet—or in any case should meet. The conflict here though is more apparent than real, and a small dose of dialectic will point the way to the synthesis we need. Education is serious because it is structured and must be structured: you just can't learn calculus before you know addition and subtraction. So is there such a thing as structured fun? Of course, it is called a *game*. Our goal is to optimize the learning experience by making it intrinsically rewarding—fun. So the game becomes a likely tool.

Now you can decipher our not altogether whimsical acronym, CEGOLLE, for Computer Enhanced Game Optimized Language Learning Experience. But what sort of games do we want to play?

Learning to Ski

Some people teach language for the sake of language: "French is such a beautiful language." Our goal is language for two-way communication. This means listening and speaking, reading and writing.

The written language is not a separate reality independent of the spoken language, and for our students, language is both spoken and written, even though most speak more fluently than they write, mainly because they use their mouths more than they use their pens. The message for foreign language learning is clear. Learning is doing and vice versa. This is because language is a skill, not just a body of knowledge. You can read for weeks about skiing and memorize all the rules, but you don't really start learning how to ski until you strap on the skis and head down a snowy slope.

Maybe we could trick our students into learning our subjects just as Big Bird conned them into learning numbers and the alphabet.

So we want games that involve the student in doing the language in both the spoken and written dimensions. But before defining some specific game possibilities, I would like to deal with a few pitfalls.

R2D2: Polyglot Pedagogue?

I really wouldn't mind replacing foreign language educators, myself excluded, with machines. I have had a great deal of experience with both and have found the latter more reliable, consistent, and much less expensive. However, there is very little hope, or danger, as the case may be, of this

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Cegolle, continued...

happening in our lifetime. The main reason being the nature of language.

To learn to communicate, you must communicate, and it will be a good while before machines acquire human level competence in communication. Anyone who objects to the use of computers for fear they could replace him may well be right, but this is only a smoke screen. For better or worse, it won't happen soon. The real basis for objection lies elsewhere.

Fuzzy Studies and the Lab Crash Syndrome

When you are dealing with language educators or anyone else in the humanities, you often encounter hostility to technology in general and to the machine in particular. A good example is the foreign language lab. Back in the sixties, there was a strong trend toward language labs. The suppliers made extravagant claims for their equipment. Zealots within the field corroborated the claims and pleaded for funds.

Administrators took the bait and bought, while the rank and file stood by a bit skeptically to see if all the promises would come true. They didn't, and the result was ultimately the lab crash with instructors and students bailing out right and left, to the point that now language reseachers (with clairvoyant hindsight) point out that the language lab was not the answer.

I happen to believe in the language lab because I learned a great deal of French in a lab at the Institut de Phonetique in Paris. The differences between what I experienced and the scene at the typical U.S. language lab are laden with lessons for the computer movement. The U.S. method was to install relatively complex hardware and leave it up to the teachers to learn how to use the stuff and to create their own software, a very dehumanizing experience for the average fuzzy studies professional.

At the Air Force Academy, we had a lab console that was worthy of the Space Shuttle controls in complexity. The full-time lab technician was the only one who ever had a really firm grasp on the machine.

Our Canadian exchange officer at the time, a specialist in lab applications, did come up with some workable programs. The rest of us, students and instructors alike, just muddled on through at a tremendous cost in time and harbored an ever-growing hatred of those damn machines.

In Paris, the lab was run by professionals who acted as if they really believed that their machines and their programs could help us learn. And they did. The lesson here is that the hardware must be simple and robust and the troops in the trenches, not just the local field marshalls, must want it. For software, there must be two options: efficient authoring systems for the do-it-yourselfers and quality off-the-shelf packages for everybody else. Easier said than done.

You Can't Fly in a Vacuum: The Industrial-Academic Connection

Without that invisible medium air, airplanes, even the best of them, can't fly. Software is the usually invisible medium which makes computers fly, and right now good CEL software for foreign languages is rarer than oxygen in outer space. The federal government has invested some grant money to try to help fill the void. Here is an example from an NSF funded project entitled "Implementation of a Generative Computer Assisted Instruction System on a Small Computer."

```
TRANSLATE FROM GERMAN TO
ENGL I SH:  JEDE SCHONE KUH
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CIRCLE 196 ON READER SERVICE CARD

Cegolle, continued...

```
RIGHT. TRANSLATE FROM GERMAN
TO ENGLISH: JEDE KUH SCHLAGT
DIE FRAU.

EVERY COW HITS THE WOMAN.
RIGHT.
```

I suggest we look elsewhere for a solution.

Why not an industrial-academic complex to rival the old military-industrial complex? Industry has people who speak computer language. Around academe, there are some people with brilliant ideas on how to use computers in teaching. Neither group stands much of a chance of producing good software alone. But companies like Texas Instruments are now using professional educators as consultants in the creation of teaching software.

> ***The industry profits when quality software helps sell hardware.***

The industry profits when quality software helps sell hardware. The universities benefit from the availability of educational software programs which they could not have created alone. The key, then, to getting CEL off the ground is going to be software which for the most part, doesn't exist yet but which could result from the industrial-academic connection. So make friends with the vendors.

CEGOLLE Attack:
Space Invaders a la Mode

Now for the game. Imagine you are enrolled in basic French. It is a five-semester-hour course consisting of five hours of communication seminars with the instructor and five hours of computer-integrated multimedia lab time per week. And that's it, no required homework. You are in the university learning center. Even though you can access the university computer system over the phone line through your own home computer, you like to work in the learning center when you can find a free terminal because you like the fancy peripherals they have here: videodisc, video cassette, random audio, student voice recording and playback, etc.

You just started French yesterday and got the full explanation of how the course would work. Most of the basics would be instructed in the lab. Class time would be reserved for questions from the students, instructor comments about results on the previous lab quiz, and a lot of human-to-human communication: student-instructor and student-student. Today is the first lab lesson.

You find a free learning station, put your headset on, and log in with your name and student ID number. The computer says "hello" and asks if you would like to choose a code name to protect your files for the rest of the semester. You start to say "no" but then decide you don't want to risk somebody tampering with your quiz results and type in FRODO. The computer reminds you not to forget your code name for future log-ins and then flashes up a list of your present courses, asking which course you now wish to work on.

You reply "French" and immediately get the introductory frame for your first French lesson which explains the goals of this first lesson and instructs you what software you need to get from the reserve desk for this lesson. You get it, set everything up, then for 20 minutes your attention alternates from the computer monitor to the adjacent TV screen as animation, still frames, film clips, script, sound, and voice introduce the essentials of lesson one. Then for another 20 minutes video and audio cues elicit your responses in French, which

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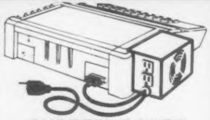

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CIRCLE 145 ON READER SERVICE CARD

Cegolle, continued...

are recorded through your headset microphone and then replayed at the end of each segment of the exercise.

Cockfight Squadron

As a student of French you have been assigned to Cockfight Squadron.

Then comes the quiz. When your instructor promised you would like it, you had your doubts. But the computer isn't showing anything about a test. It says that as a student of French you have been assigned to Cockfight Squadron (you learn later that a buddy in Spanish is in Condor Flight and a guy in German in Eaglestrike). Your first attack mission is called Interdict.

Depending on how confident you feel about what you just studied, you can choose one of the four possible mission levels: Cadet, Pilot, Ace, or Superace. You opt for Superace because you think you understand the first lesson pretty well, and besides you like a challenge. The computer then explains that you will have a total of five spacecraft with which to complete the ten sorties of ten seconds each which comprise this mission.

You then learn that in Interdict a French sentence which is missing a word appears at the top of the computer video monitor screen. At the same time, a video representation of the reality which the sentence should express appears on the TV monitor. You must identify the place in the sentence where a word is missing by zapping the space where there should be room for that word. If you miss or choose the wrong space, your craft explodes, and you must start the sortie over again with a new craft. If you hit the right space, the sentence blows apart, making room for the missing word.

At the same time, four different words appear below your craft on the screen. You must home in on the right word and zap it. If you miss, choose the wrong word, or take too long, your craft explodes, and you must call up a new one to complete that portion of the sortie. If you hit the right word, all the wrong choices disintegrate and the right one pops up into its place in the sentence. At this point, you hear the sentence repeated twice and again see the video illustration of its meaning.

You put your hand on the joystick controller and press Return to start. After six sorties your forehead is damp. You have only one craft left and that is only because you made a lucky guess on the last sentence. You lose your last craft on sortie seven. The computer says you must begin the mission again and suggests you try something simpler than the Superace level.

You agree, opt for Pilot, and start the mission again. Five minutes later you have completed the mission losing only four craft. Then the TV screen comes alive with the mission debrief conducted by a 25th Century version of the squadron operations officer. You get an explanation of why you lost those four craft and an admonition to review your manuals so as to never again make the same mistakes.

Then the computer comes back and asks if you would like to play Intercept or Scramble. You look at your watch. You have been at the learning station for 53 minutes. You decide to do Intercept because the description on the screen indicates that the random access audio peripheral is essential for this game and you haven't been able to afford one for your home set up yet. So you opt for Intercept at the Pilot level.

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CIRCLE 301 ON READER SERVICE CARD

Cegolle, continued...

The game is like Interdict except that instead of word choices appearing on the screen you hear them one at a time over the headset and must zap the right choice as soon as you hear it. The sentences are new but similar to those of Interdict. After another five minutes, you have finished the mission with only two craft lost. The mission debrief is very short. The computer asks if you would like to redo any previous parts of the lesson or play Scramble. You have been there a little more than an hour already, and you need a break, so you decide to quit for now.

> ***If you latch onto a word in the wrong sequence, your craft is sucked down into the screen and you must call up a new one.***

Dinner Break

After dinner that evening, you log in through your home system. You install French Diskette #1, which you checked out from the learning center, call for Scramble and learn that each sortie involves pulling a group of words scattered at random over the screen into a coherent sentence using a tractor beam from your craft. If you latch onto a word in the wrong sequence, your craft is sucked down into the screen and you must call up a new one. No TV video or random access audio this time, but it is too far back to the learning center, and by this time there is probably a long waiting line for every station. You would have to stay there half the night just to get on.

Things haven't changed. Dad said it used to be that way in every comp. sci. course he ever took. Never enough terminal time available. Many of the brilliant guys got fed up and switched majors. It took a lot of patience just to make it through. At least now with your home system you have an option.

So you jump into Scramble, do the first mission once through at Pilot level, then again at Superace. No mission debrief possible without the TV video peripherals, but by the second time through you do it perfectly anyway. You call for Scramble mission two and start it off at the Ace level. Perfect score the second time through. You decide you want a change and call up Interdict mission two. After about an hour, you have completed the five missions in both Interdict and Scramble.

You decide that tomorrow, before going to the French communication seminar, you'll spend 20 minutes in the learning center and do the four Intercept missions you didn't get to earlier. You know your instructor will have a printout of missions attempted and success rate for everyone in the class, and you want to make a good impression right at the beginning. And anyway with all the variety involved, it's more fun than Space Invaders.

In fact, you decide to skip the TV video games for tonight and instead log in on the National Postal Network and write your girlfriend back home a letter about the first two days of classes, especially your French course. After all, French is for lovers. She happens to be on her system and answers you right away. She says high school senior French is a drag and wishes she could be in that course with you. You sign off with love and kisses and "wish you were here." You have to make sure she doesn't forget, but mustn't overdo it either. Besides you are going to have to get some sleep and start early tomorrow if you want to finish those Cockfight Intercept missions before French class.☐

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CIRCLE 246 ON READER SERVICE CARD

Copying a Cosmos

Peter Payack

I
On a piece of paper draw a picture of a star.
Color it yellow.
Then draw four other stars of varying sizes
on four additional sheets of paper.
Make one extra large using the limits of the page,
color it red.
The smallest one will be a neutron star,
use a black crayon on it.
The other two should be orange and blue-white.
Bring these to an instant copy center
and have them run off 40 billion copies of each picture
using paper of the appropriate color.
Don't worry about the price;
The rate drops after the first 10,000 copies.
The colored paper is extra.

II
While these are being processed
draw some planets on other sheets of paper.
Include
large planets, planets with rings,
tiny crater-strewn planets, dead planets,
planets with colorful bands of gas,
planets inhabited by superior civilizations,
and half-formed planets (planetoids).
When the copy center is finished duplicating
the 200 billion stars,
bring them the planets.
They'll love you!
Since it is not known how many stars have planets
100 million copies of each drawing should do it.

III
Get a really sharp pencil
and make random dots all over a sheet of white paper.
These dots will be the numberless atoms of hydrogen
which flow randomly throughout interstellar space.
Try to make 100,000 on a page.
If necessary use a microscope.
Make a trillion copies.
Technically this is not nearly enough hydrogen atoms
but we have to draw the line somewhere.
Bring this load to a second printer.

IV
Next get a piece of pitch-black paper
and have its blackness duplicated.
Have the attendant at a third duplicating center
set the dial at infinity.
Tell him money is no object.
If you must, intimate that your
"old man is really loaded!"
These black pages are the abysmal expanses
of cold emptiness
which most of galactic space consists of.
Place them in a meat freezer until ready for use.

V
Rent a fleet of 18-wheelers
to transport the copies home.
Unload them in your front yard.
When this is accomplished you are almost finished.
Take a brief rest.

VI
Handletter invitations
and invite the whole neighborhood to a party
to help with the completion of the project.
Threaten them by saying it's the only way
you'll ever get the yard cleaned-up.
They'll come running!

VII
Ask the Fire Department to donate the services
of their longest ladders.

VIII
On a clear windless night,
extend the ladders upward so that the tips
are resting against the rafters
which keep the night sky from collapsing.
Anchor the ladders securely into *terra firma:*
Why risk a lawsuit from a careless neighbor?

IX
Using paste, tacks, staples, tape, and hooks
affix the copies to the underside of the celestial dome.

Watch out for orbiting satellites!

Stars can be attached
singly,
put in pairs,
grouped in clusters,
or arranged in constellations.
Planets should be strewn around the individual stars.
The black pages of empty space
should be taken out of the freezer
and along with the reprints of the hydrogen atoms,
liberally affixed throughout.

X
If everyone co-operates,
and nobody falls off a ladder,
the project should be completed by sunrise. □

Peter Payack, 64 Highland Avenue, Cambridge, MA 02139.

Learn To Touch Type

Stephen Stares

For many computer owners, a word processor is one of their most valuable programs. It bestows the freedom to create and produce documents away from the confines of the office and without the help of secretaries. Often, though, a severe cramp in this new found freedom is the inability to type quickly. Inaccurate typing is of less significance, since documents can always be cleaned up magnetically before printing. But basic slow speed, the inability to put thoughts down on paper at a reasonable pace, is always frustrating. Therefore, if your heart's desire is to write, be it great literature, seedy novels, sober articles, or mere business letters, then it is well worth your while to learn the art of touch typing.

An idea of the speeds available with different techniques is given in Figure 1. Hunt and Peck is a miserable form of typing in which a single finger on each hand is used to pick letters off one by one. It is the most natural form of typing for the novice to slip into, but has severe restrictions on the upper speed which can be achieved. Far better to take the plunge, pass through a period of undeniable awkwardness, but emerge at the end a true touch typist.

The Art of Touch Typing

It is a fact that most copy typists do not absord the content of what they are typing. The text flows in at the eyes and flows out again at the finger tips; the brain in the middle can be occupied, at least partly, with far more interesting things. In other words, touch typing is not an intellectual exercise; it is a purely reflexive skill.

At first, typing is a slow process as the following steps are consciously followed:

1. The eye reads a letter (or the mind conceives of one).
2. The brain recognizes the letter.
3. The brain decides where the letter is on the keyboard.
4. The brain selects the finger to be used.
5. The brain directs the finger to the appropriate key.
6. The letter is typed (or mistyped as the case may be).

Figure 1.

Hunt and Peck Typing	15-25 words per minute
Handwriting	20-30
Average Touch Typing	40-60
Very Good Typing	70-90
Superb Typing	100+

The objective in touch typing is to merge the four middle stages which take place in the brain, so that they become one instinctive action, as natural as handwriting. This can be developed only with practice; learning to type shares some of the characteristics of learning to play a musical instrument.

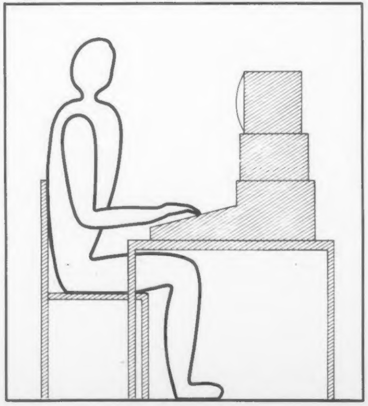
Preparing To Type

There used to be a children's radio program which began: "Are you sitting comfortably? Then we'll begin." Sitting comfortably is of particular importance for typing. Poor posture will haunt you with strain, backaches, and general tiredness. It is, therefore, worth the effort to spend some time preparing a good work station for your typing.

Absolute specification of chair and table heights is impossible, since everything depends on the shape and size of the individual. In general, though, the following rules should be followed in determining a typing position (see also Figure 2):

- Sit upright, with the back straight.
- Place the feet squarely on the floor, a little way apart. The thighs should be parallel with the floor.
- Dangle your arms by your sides, and then without moving the elbows, raise

Figure 2.



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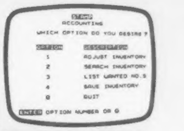
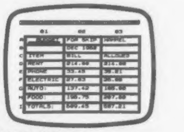


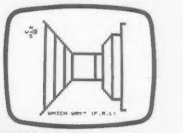
```
STAMP
ACCOUNTING
WHICH OPTION DO YOU DESIRE ?

OPTION       DESCRIPTION
  1          ADJUST INVENTORY
  2          SEARCH INVENTORY
  3          LIST WANTED NO.S
  4          SAVE INVENTORY
  0          QUIT
ENTER OPTION NUMBER OR 0
```

☐ **THE STAMP COLLECTOR (#31)** Inventory and store up to 600 SCOTT numbers in a single session showing quantity on hand, by major classification, and provide full want list support.

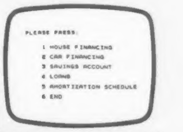


☐ **VU-CALC (#11)** This program constructs, generates, and calculates large tables for financial analysis, budget sheets, and projections. An immensely powerful analysis chart.



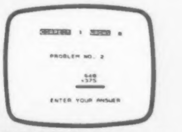
```
WHICH WAY? (F,R,L)
```

☐ **SUPERMAZE (#34)** Navigate your way through a three-dimensional maze, with trapdoors, gold bars, marker stones, and compass. Ten separate mazes. Three-dimensional graphics.



```
PLEASE PRESS:
   1 HOUSE FINANCING
   2 CAR FINANCING
   3 SAVINGS ACCOUNT
   4 LOANS
   5 AMORTIZATION SCHEDULE
   6 END
```

☐ **PERSONAL FINANCE PLANNER (#28)** Perform calculations, finance a house, a car, keep savings accounts, repay loans and calculate an amortization schedule which can be generated for any of the financial programs.



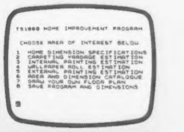
```
CORRECT 1 WRONG 0

PROBLEM NO. 2

    548
   +375

ENTER YOUR ANSWER
```

☐ **SUPER MATH (#14)** Drill yourself on addition, subtraction, multiplication, and division with five levels of difficulty. Each problem graphically depicted.

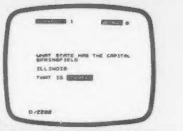


```
TS1000 HOME IMPROVEMENT PROGRAM

 CHOOSE AREA OF INTEREST BELOW

1  HOME DIMENSION SPECIFICATIONS
2  CARPETING YARDAGE ESTIMATION
3  INTERNAL PAINTING ESTIMATION
4  WALLPAPER ROLL ESTIMATION
5  EXTERNAL PAINTING ESTIMATION
6  AREA AND DIMENSION CATALOGUE
7  DRAW YOUR OWN FLOOR PLAN
8  SAVE PROGRAM AND DIMENSIONS
```

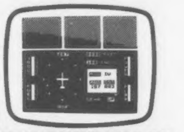
☐ **THE HOME IMPROVEMENT PLANNER (#29)** Store up to 20 room measurements (length, width, height), compute total area in each (wall, floor), estimate costs of painting, wall papering and carpets and draw house blueprints.



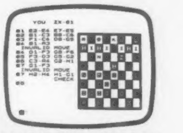
```
WHAT STATE HAS THE CAPITAL
SPRINGFIELD
ILLINOIS
THAT IS

0/2200
```

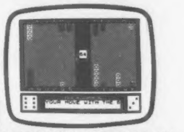
☐ **STATES AND CAPITOLS (#32)** Test yourself on the fifty states and their capitols. Three options of review are available. (1) States, you provide capitols. (2) Capitols, provide states. (3) A mix of states and capitols.



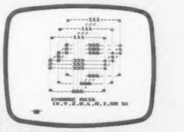
☐ **THE FLIGHT SIMULATOR (#6)** Take control of highly maneuverable light aircraft. With full controls, instrumentation and navigational aids to avoid hazards in landing.



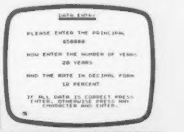
☐ **CHESS AND CHESS CLOCK (#7)** Six levels. All the legal moves including castling and enpassant. Keeps a separate record of plays made for easy reference. Play another opponent or match wits with the computer.



☐ **BACKGAMMON AND DICE (#8)** A perfect blend of chance and skill. Uses machine code to choose its moves. Full game including graphics board, rolling dice, and double cube. Play the computer or another opponent.



☐ **THE CUBE GAME (#9)** The cube can be displayed in three views: (1) Solid; (2) Two-Dimensional (unfolded); and (3) See-thru cube (3-D). You start with the cube solved, set it up any way you like, or pick up from a previous session.



```
DATA ENTRY

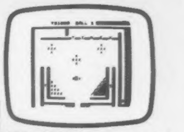
PLEASE ENTER THE PRINCIPAL
$50000

NOW ENTER THE NUMBER OF YEARS
20 YEARS

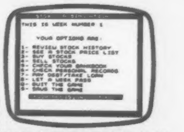
AND THE RATE IN DECIMAL FORM
12 PERCENT

IF ALL DATA IS CORRECT PRESS
ENTER. OTHERWISE PRESS ANY
CHARACTER AND ENTER.
```

☐ **REAL ESTATE INVESTMENT ANALYSIS (#30)** Two different investment strategies. The first selection allows the user to choose between renting or buying. The second selection consists of a detailed analysis of the rental investment property.



☐ **PINBALL (#35)** Plays like real pinball complete with flippers, bumpers, "nudge," bonus points and more. Uses fast, efficient machine code to choose its moves.

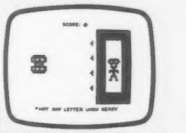


```
THIS IS WEEK NUMBER 1

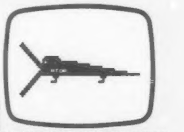
   YOUR OPTIONS ARE:

1- REVIEW STOCK HISTORY
2- SEE A STOCK PRICE LIST
3- BUY STOCKS
4- SELL STOCKS
5- CHECK YOUR BANKBOOK
6- CHECK PERSONAL RECORDS
7- PAY DEBT/TAKE LOAN
8- LET A WEEK PASS
9- QUIT THE GAME
0- SAVE THE GAME
```

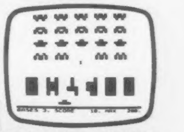
☐ **STOCK MARKET GAME (#27)** Bull or bear? This realistic simulation lets you analyze information, buy and sell stocks, take out and pay off loans . . . and win, if you can accumulate $50,000 in "The Market."



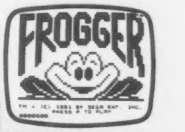
☐ **FORTRESS OF ZORLAC (#36)** A super fast game in which you are the commander of a fleet of spaceships. Your mission is to rid the galaxy of the dreaded alien, ZORLAC.



☐ **ATOR THE ABC GATOR (#33)** Designed to teach recognition and sequence of the alphabet. Combines computer instruction, music and video games.



☐ **SPACE RAIDERS, BOMBER (#5)** Timex/Sinclair version of the popular arcade games full of bombs and rockets and collisions with skyscrapers.



```
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        PRESS P TO PLAY
```

☐ **FROGGER (#37)** Plays like the arcade game. Hop the frog over traffic, snakes, crocodiles, and treacherous diving turtles before time runs out.

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Touch Type, continued...

the forearms until they are parallel to the floor, or sloping slightly up and away from you. At this point, the fingers should be curving down to rest on the home row of the keyboard, that is to say, the middle row of letters. The backs of the hands should also be parallel to the floor. You should not have to reach for the keyboard.

- The screen should be comfortably in front of you, clearly visible without having to lean forward or down. On my Apple, I have placed a thick book between the monitor and the disk drives to gain a little more elevation for the screen. It seems to me that the built-in screens of some computers are really too low.
- Material to be typed (even if only rough notes) should be propped up to the left or the right. I find that one of the typing supports sold in business stationers is a great help. These usually come complete with magnetic paper holders and line guides.

> ***A novice can be productive immediately.***

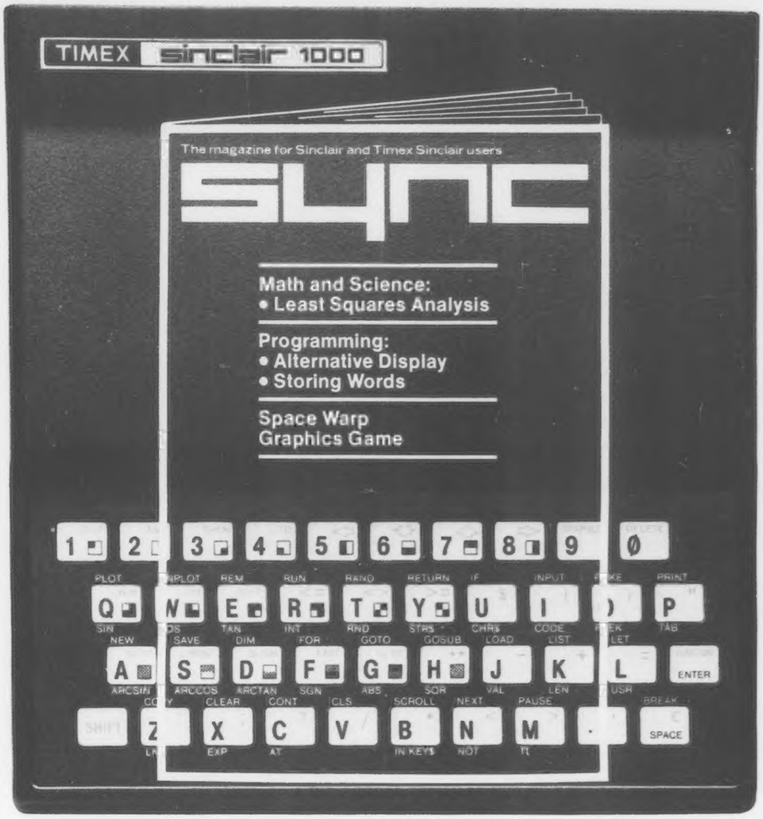
The furniture used to achieve this ideal will depend upon availability or purse. Office style furniture is clearly very suitable, if expensive, with chairs of adjustable height and a range of tables designed to hold typewriters. Absolute conformity to the ideal, however, is not necessary, and adequate adjustments to existing furniture can often be made using cushions, books, and other props. If you still end up with an unsatisfactory arrangement, the ensuing aches and pains will soon let you know.

Starting To Learn

Learning to type with a computer is much easier than learning with a conventional typewriter:

- There are no problems with paper alignment
- After the initial setup, a good word processor eliminates all worries about page layout—margins, indents, line spacing, etc.
- Computer programs are available for self-teaching.
- Mistakes are easier and less messy to correct.

Above all, and following on from the last point, even a novice can prepare a good looking document, since however badly typed initially, it can be cleaned up magnetically and printed without a trace of the original errors showing. Hence, a novice can be productive immediately. With a conventional type-



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☐ Space Warp: A Graphics Space Game
☐ How to Reduce "Blank Screen Time"
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writer, production in the early stages of learning is either extremely slow, or the final document is knee deep in whiteout liquid.

A systematic approach to learning is highly desirable. It is possible, of course, to use conventional self-teaching material, such as can be found in many libraries and book shops. However, why not instead call upon the considerable power of the computer as a teaching tool? Several teaching programs have been developed and two are discussed later in this article. Such programs can present graded material for learning, monitor progress, and even adjust the lessons to concentrate on weak keys. They are ideal for teaching touch typing, since the eyes naturally concentrate on the screen, which is a prime requirement for practicing.

It is better to practice 15-20 minutes each day, rather than have a two-hour blitz every Saturday morning. A longer period each day is, of course, better. If possible, set aside a regular period for practice, preferably when you are reasonably fresh.

Learning The Letters And Punctuation Marks

A basic feature of touch typing is that each key is typed by a specific finger and no other. The keys for each finger are allocated in a logical manner, so that each key can be reached comfortably, without having to stretch too much. The aim is to make the typing of each letter so automatic that no conscious thought is required. First though, the keys must be learned, and this can be done by studying the diagram of the keyboard presented in Figure 3.

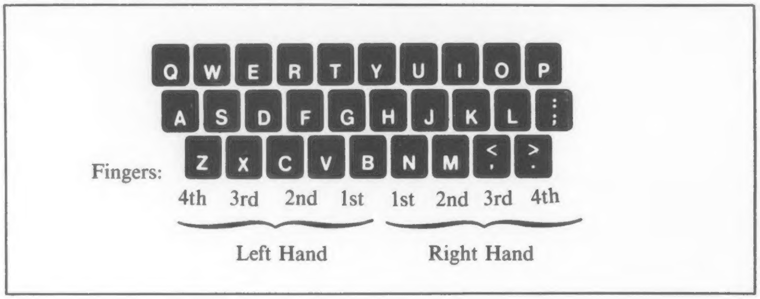
Note that the thumbs are used for nothing more than hitting the space bar. Strict teaching demands that only the right thumb be used, but I really cannot see why. Anyway, the main point is that this leaves only the four fingers of each hand for the serious task of striking the keys.

A vital point to remember, is that a rest position, to which it should always return after striking a key, is defined for each finger. This rest position is just above what is termed the *home row*, that is, the middle row of letters in the diagram above. The fingers of the left hand are positioned over the letters A, S, D, and F, while the fingers of the right hand are positioned over the letters J, K, and L and the semicolon. To strike the other keys, the fingers move in a diagonal slanted to the left, as indicated by the lines on the diagram. Thus the left little finger moves from the home position over the A key, up and left to strike the Q key, and down and right to strike the Z key. The middle finger of the right hand moves from the home position over the K key, up and left to strike the I key, and down and right to strike the comma key.

The two index fingers have to work overtime, since they must deal with two columns of letters. The left index finger strikes the letters G, T, and B, as well as F, R, and V. The right index finger has the additional burden of the letters H, Y, and N, along with J, U, and M.

For all keys away from the rest position of the fingers, the action is always three-part: move the finger, strike the key, move the finger back to the rest position. The action of striking the keys should be a sharp, quick tap. A slow uncertain prod can lead to repeated letters, and a groping action often leads to two keys being struck together, with uncertain results.

Figure 3.



On computers which allow the typing of both capital and small letters (upper and lower case), the use of the shift key must be learned. To form a capital letter, it is usually necessary to strike the appropriate key while at the same time holding down the shift key. A conventional keyboard has two shift keys, one at the left and one at the right. In this case, the rule is to use the little finger of the hand not being used to strike the letter key, to hold down the nearest shift key. However, computers vary considerably in their implementation of the shift, so you will have to study the particular characteristics of your machine before deciding on the best technique to use.

For true touch typing, it is essential to learn to type without looking at the keyboard. Therefore, when practicing after the keys have been learned, glue your eyes to the screen. Occasional glances to ensure that hands are in the correct positions are permissible, but visual searching for the keys must be eliminated.

Before worrying about the numbers and the symbols, it is best to learn the letters and punctuation marks thoroughly. These are the keys which are used most frequently, and mastery of them is nine-tenths of the battle of learning to touch type. Therefore, the next step is to build up speed and accuracy on the letters and punctuation marks, leaving the numbers and symbols until later.

Developing Speed And Accuracy

Quite early on, you will find that you have typed a set of letters without consciously having directed your fingers. You will have conceived of the word "the," and suddenly "the" is on the screen in front of you. What ecstasy! It is akin to the golfer's first full sweet drive down the fairway, or to the first time a novice water skier rises out of the water and starts planing. You have passed through the main barrier, and although there is hard work ahead, the knowledge that you can do it makes all the difference.

There are now two distinct objectives to pursue; speed and accuracy. Experience shows that it is impossible to concentrate on both at the same time.

Improved speed is the main goal; to a large extent, accuracy will follow naturally. To develop speed, it is necessary to push hard, giving your fingers every chance to demonstrate their knowledge of the keys, ignoring, as far as possible, any evidence to the contrary. It is a little like weight training; if it doesn't hurt, it is not doing you much good. Similarly, if you don't make mistakes while going for typing speed, then you are not trying hard enough.

For accuracy, it is necessary to slow down a little. Deliberately think, or even say out loud, each letter before typing it, and concentrate on making each action sharp and precise. Aim at a regular typing action, possibly tapping your foot and typing to the rhythm. When starting a session on accuracy, start slowly and well under control, and then build up to a comfortable speed.

Decide before starting to type whether to practice for speed or accuracy. A possible pattern for a session might be to start with accuracy, build up to the maximum comfortable speed, practice a

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while, and then spend some time on speed. It might be best to end up again on accuracy, so that you don't lose heart. As a guide, if accuracy is above 95 percent (5 errors in 100 keystrokes), then you should push for more speed. On the other hand, if your accuracy is below about 85 percent, then more time should be spent on this aspect.

Note that a typist using a conventional typewriter should be aiming at an accuracy of 98 or 99 percent, but because error correction using a word processor is so simple, and because corrections leave no trace on the final document, a higher error rate can be tolerated by a computer user.

Vary the practice exercises with some real typing. If you are learning to type for a specific purpose, then finding suitable material will not be a problem. If you are stuck for material, then try typing your personal letters, or making comprehensive notes on computer procedures. You could even try your hand at writing an article.

Keep notes on progress. I divided a page into sets of three columns to record the day, accuracy, and speed of each session as calculated by the Microsoft *Typing Tutor II* program (see below). If you must time speeds and count errors by hand, then one self-test every two or three days is sufficient.

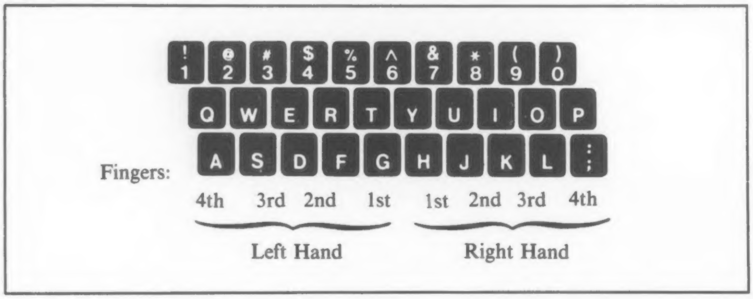
When you start practicing in earnest after having learned the keyboard thoroughly, your speed is likely to be between 5 and 10 words per minute. With regular practice, a build up of 5 words per minute each week is attainable. If this seems slow, take heart—within a month you should be typing as fast as you can reasonably write by hand, and within two months you could be classified as an average, if unspectacular, typist. Even if you are slower than this, and many will be, be encouraged by steady progress. Remember that once achieved, a reflex skill like this is hard to lose.

The Numbers And Symbols

Once the letters have been mastered, it is easy to extend the technique to take in the numbers and symbols. The numbers are located in a separate row of keys located above the top row of letters, Q to P, as shown in Figure 4.

Each finger has a specific column, or pair of columns, to look after on the keyboard as determined previously. It is, therefore, a straightforward matter to extend this pattern to include the number keys. Hence the left hand little and middle fingers type the 1 and the 3 respectively, while the index finger looks after both the 4 and the 5. The right hand follows the same pattern.

Figure 4.



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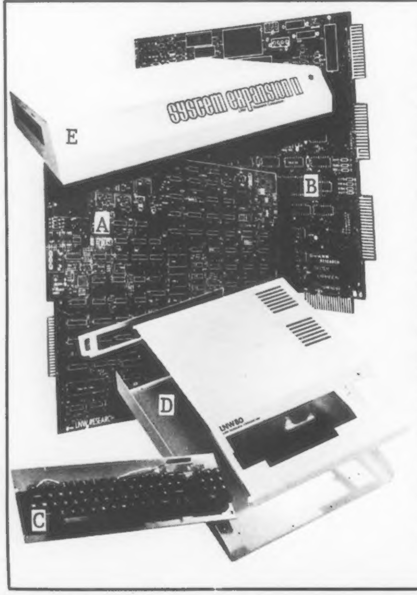

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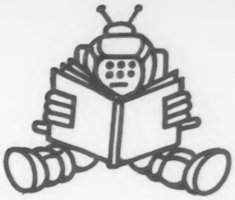

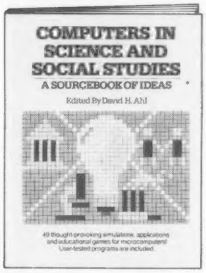
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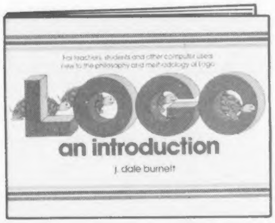

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Touch Type, continued...

The symbols are only slightly more complicated in that most of them require the simultaneous depression of the shift key. Since the locations of the symbols on the keyboard vary depending on the specific computer considered, it is not practical to describe key locations in detail. However, the general rule is the same as for typing capital letters; use the appropriate finger to strike the key, as determined by the letter or number, and at the same time hold down the shift key with the little finger of the other hand. As noted earlier, if your keyboard does not conform to the standard pattern, then you will have to work out your own procedure.

> ***I found typing amidst the sounds of the arcade rather disconcerting.***

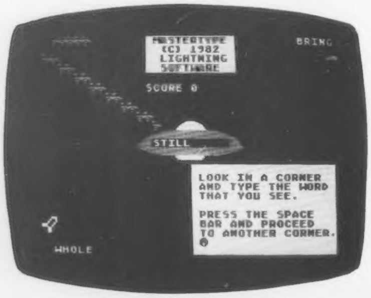
Although it is useful to build up speed and accuracy on the numbers and symbols, they are not used as often as the letters and punctuation marks, so if you must make a choice, spend your practice time on the letters.

Typing Teaching Programs

I have tried two teaching programs, *MasterType* by Lightning Software and *Typing Tutor II* by Microsoft. Both have advantages and disadvantages. I found that *MasterType* was better for initial learning, but that *Typing Tutor II* was better for building up speed and accuracy.

MasterType

MasterType is a typing game. You have control of a command center in the middle of the screen, and ranged around you are four enemy bases, each one occupied by a word. The words send out missiles to attack the center, and you can escape damage only by typing that word before the missile hits. If you manage to type a word while no missile is on the way, that word is destroyed. The base survives and is occupied by the next word. The game continues until you have destroyed all the words, or until the words have destroyed the center (which takes two hits on one side).



```
MASTERTYPE
(C) 1982
LIGHTNING
SOFTWARE
                    BRING
SCORE 0

STILL

LOOK IN A CORNER
AND TYPE THE WORD
THAT YOU SEE.

PRESS THE SPACE
BAR AND PROCEED
TO ANOTHER CORNER.
WHOLE
```

To play the game, one of 17 lessons is selected, together with a speed which roughly corresponds to a typing speed in words per minute. Each lesson contains 40 words, and the lessons are graded to concentrate on specific keys. For example, lesson 1 teaches the letters of the home row, while lesson 3 is on three, four, and five letter words on the home row.

As words are destroyed, points are scored. Depending on the final score, encouragement is given in a few standard phrases. You can choose whether or not to see the letters as they are typed; choosing not to see them nets you more points. Scoring over 10,000 points, which can be achieved when winning with a typing speed of between 15 and 20, will result in the recommendation to go on to the next lesson.

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SOFTWARE PROFILE

Name: MasterType

Type: Educational (typing tutorial)

System: Apple II+48K, Atari 32K, IBM PC 64K

Format: Disk

Summary: Good introduction to touch typing.

Price: $39.95

Manufacturer:

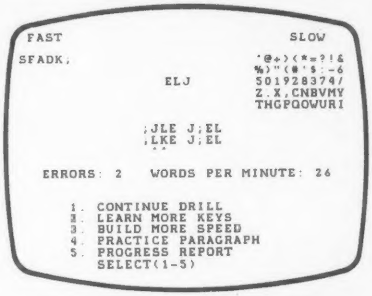
Lightning Software
P.O. Box 11725
Palo Alto, CA 94306
(415) 327-3280

For learning the keys, this is an excellent program. For further practice, though, it tends to be repetitious. I found myself stuck on a plateau of achievement, unable to achieve enough points to earn the recommendation to go on to the next lesson, and yet weary of repeating the same words in the same order. Also, part of my skill was due to having learned that lesson by rote, rather than having really built up the typing reflex. Although you can specify your own lessons to ease this problem, I preferred to go on to the *Typing Tutor II* program.

The graphics in *MasterType* are quite spectacular. Unfortunately, the program is also very noisy, and I found typing amidst the sound of the arcade rather disconcerting. Perhaps the younger generation finds this the ideal environment, but I don't. The sound can be turned off, but I didn't like the total silence either.

Typing Tutor II

Typing Tutor II is a rather more sober program than *MasterType*. It functions in two modes, either to teach the keys, or to provide practice in typing complete paragraphs. In either mode, it has the remarkable feature of adapting the lesson or practice paragraph to your actual performance. Thus, if the program detects that you are particularly slow or inaccurate on a certain letter, then that letter will come up more often for practice.



```
 FAST                                 SLOW
SFADK;                          '@+)(*=?!&
                                %)"(#'$:-6
                     ELJ        501928374/
                                Z.X,CNBVMY
                                THGPQOWURI

                 ;JLE J;EL
                 ;LKE J;EL

   ERRORS: 2   WORDS PER MINUTE: 26

        1. CONTINUE DRILL
        2. LEARN MORE KEYS
        3. BUILD MORE SPEED
        4. PRACTICE PARAGRAPH
        5. PROGRESS REPORT
           SELECT(1-5)
```

In the teaching mode, the program introduces a set of eight letters which must be typed. The program measures response times on each key and classifies them as fast or slow. Each letter which achieves a "fast" rating is passed to a special file to make way for new letters to be introduced. A new set of letters for typing, made up of previous letters not yet classified as fast, plus new letters, is then put on the screen. After you type each set of letters, the program reports the error rating and typing speed. No allowance is made for achievements in previous sessions, but the program quickly catches up to your typing level.

Every ten sets of letters, the program

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SOFTWARE PROFILE

Name: Typing Tutor II

Type: Educational (typing tutorial)

System: Apple II, 48K

Format: Disk

Summary: Excellent for building speed and accuracy.

Price: $24.95

Manufacturer:

Microsoft Corporation
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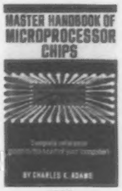
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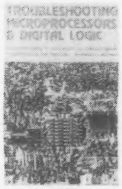
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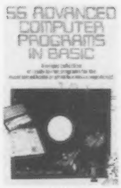
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allows you to adjust the response speed for classifying keys as fast or slow. Using this feature, the rate at which new keys are introduced can be varied.

The paragraph practice mode can be selected at any time. If selected after a session in the teaching mode, paragraphs will be made up from words using letters being practiced. If selected at the beginning of the program, words using all keys will be used. After each paragraph, overall speed and accuracy are reported, together with information on specific errors by key and a list of which keys are slow. If another paragraph is requested, it will be composed of words selected to give more practice on keys judged to be weak.

Whatever mode is selected, it is possible to specify just letters, letters and numbers, or all keys including symbols.

Overall, this is a first class program. My only complaint is that it was a little intimidating at the beginning, with new letters being introduced rapidly. Although the rate at which letters are introduced can be controlled, I much preferred to use the *MasterType* game to learn specific keys at a rate totally under my control.

Once the keys have been learned, *Typing Tutor II* is excellent for building up speed and accuracy. Although it uses a fixed pool of words which are therefore often repeated as in *MasterType*, they are presented in varying orders and combinations, and there is not the same sense of repetition as with *MasterType*.

Planning Material To Be Typed

In general, it is not good to compose at the keyboard without at least a rough outline of what you want to write. To a large extent, the advantage of touch typing is lost if too much time is spent sorting out thoughts at the keyboard. Make notes first. These could be quite extensive in the early stages, but will probably be abbreviated as experience is gained.

Typing Tutor II *is excellent for building up speed and accuracy.*

Usually, I write notes on a subject as they occur to me, more or less at random. Then I review the notes, putting them in order, and filling in the gaps as necessary. I then add subheadings to break up the text, and perhaps refine the notes a little more. Only then am I ready to hit the keyboard.

Summary And General Hints

Touch typing is a skill well worth acquiring if you plan to do much writing with a word processor. The following rules summarize the advice given here on how to go about learning:

1. Get comfortable, so that you can type in as relaxed a condition as possible.

2. Adopt a methodical approach to learning the keys and then building up speed and accuracy. Use a self-teaching book, or better, invest in one of the teaching programs available for your computer.

3. Once the keys are learned, constantly strive for higher speeds; accuracy will develop naturally, but speed comes only when you press.

4. Practice regularly each day, preferably at the same time so that it becomes a habit.

5. Vary your regular practice material with useful typing.

6. Sort out your thoughts on what to type before going to the keyboard. ☐

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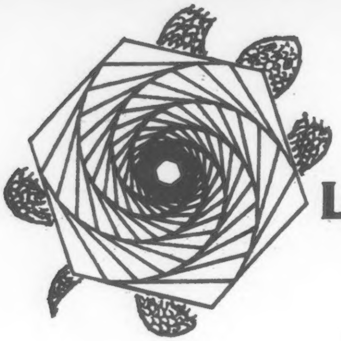


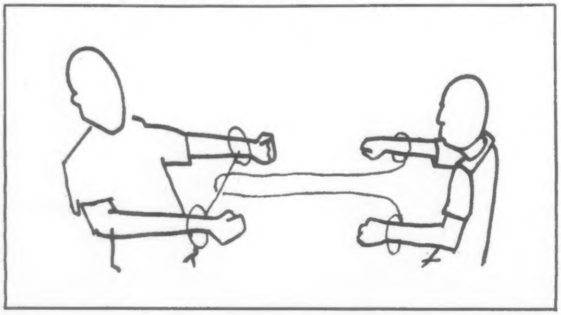
Logo Ideas

Robert Lawler

Getting off the Garden Path

Some problems are terribly difficult because they tempt you to set up your description in an unproductive way—and lead you that way down a dead end path to useless fretting. Here's a good example of such a problem, one that you might run into at a party:

You need people who are willing to work at the problem as couples. You need string and a little ability to tie knots. Here's what you do. Take one string and tie it loosely around the wrists of one "victim." (Leave about two feet of string between the wrists.) The circle of string, arms and body forms the first loop. Pass the second string through the first victim's loop and tie each end loosely around the wrist of the partner. Passing the second string through the first victim's loop made the loops interlocking. The puzzle is how these two victims can separate without cutting the string or untying the knots.

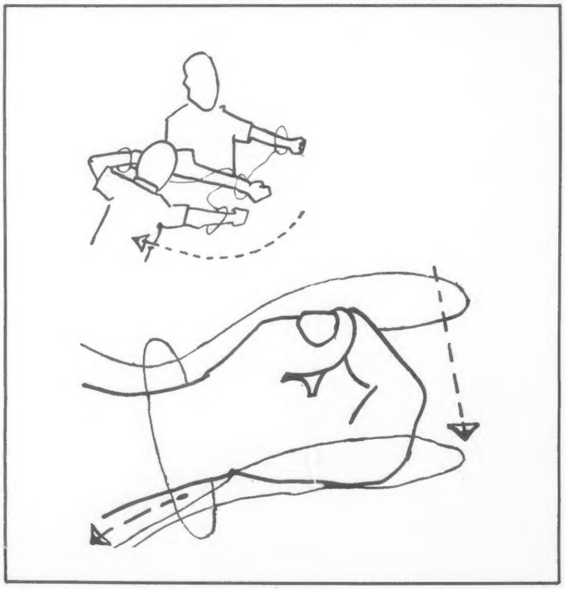


Your victims might get angry if you don't help them solve the problem. Maybe you should try it yourself before imposing on anyone else.

Most everybody sees the string, arms and body as forming a loop. This is what puts them on the dead end of the garden path. After they have been told it's illegal to slip the string loop off the end of their arms from around the wrists, they frequently try all sorts of contortions to get free, then give up. Have you given up yet? Do you see how to solve the problem?

A critical question to ask here is "what can I really count on?" Note that if the arms, body and string really do form a loop the problem *can not* be solved. That whole way of looking at the problem *must* be wrong. Next notice that the places where there might be a break in the loop can't be between the body and arms; it has to be at the wrists. There are four wrists, but if you can get the string past one of them the problem is solved. Focus on one wrist and try to think of a different way of seeing the problem. I think of it as being like the picture below:

The first string and loop go around the wrist at one end and then off somewhere else. The problem is now to get the second string out from under the first. It's easy, isn't it: through the loop, over the fist and down on the outside. This sort of problem can only be solved after you get off the garden path.



Summary

1. When you have a difficult problem, it can be very important to ask yourself, "what can I really count on in the way I am describing the problem?"
2. A second good question, when you are looking for a new way to describe a problem is "What is the point at which there is something unusual or unclear?" Focus your attention on that point. □

Robert Lawler, Centre Mondial Informatique Et Resources Humaines, Paris, France.

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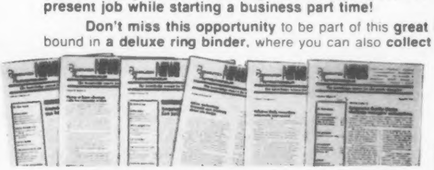

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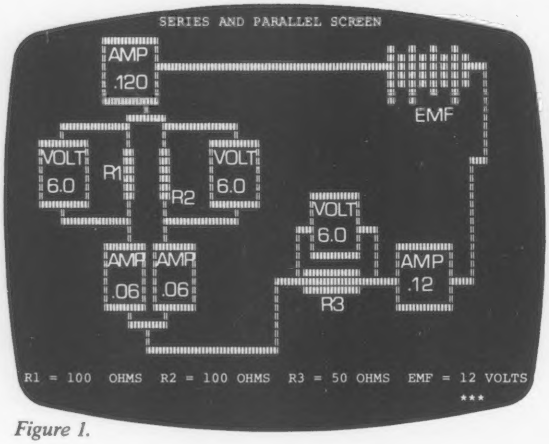
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.06
AMP
.12
R3
R1 = 100 OHMS R2 = 100 OHMS R3 = 50 OHMS EMF = 12 VOLTS
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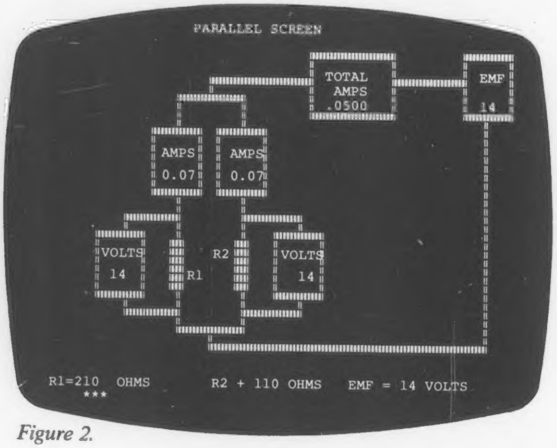
Figure 1.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AMPS
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VOLTS
14
R1
R2
VOLTS
14
R1=210 OHMS
***
R2 + 110 OHMS
EMF = 14 VOLTS

Figure 2.

David A. Holko

Physics teachers sometimes have difficulty setting up electrical equipment for labs. Faulty meters, short wires, dead batteries, power supplies without fuses, loose connections, and wrong size resistors are just some of the reasons for the difficulty.

The following program simulates circuits for experiments on series, parallel, and parallel-series resistance circuits.

Using a graphic representation of the circuit, meters, and resistors the student can conduct measurements of voltage and amperage by keying changes in the values of resistance or source EMF. The computer shows corresponding changes on the symbolic circuit.

Figures 1, 2, and 3 show the circuits drawn by the computer on the video display.

In Figure 1, three asterisks are shown below the EMF = 12 VOLTS. As the computer runs the program, the asterisks will appear sequentially below R1, R2, R3, and EMF. If the I key is depressed while they are as shown in Figure 1, the source voltage is increased. If the D key is depressed, the source voltage is decreased.

Once a change has been made in resistance or voltage the simulated meters will show related changes.

Note: To avoid errors caused by division by zero, the values R1 = 100 ohms, R2 = 100 ohms, and EMF=12 volts are assigned if R1, R2, or EMF are changed to zero or less.

I hope these simulations stir some of your own ideas for other simulations. These simulations will simplify your labs, and allow your students to spend less frustrating time in the lab. They will also allow them more time to analyze circuit characteristics.

If nothing else, with this program, you can be sure your students won't be electrocuted or blow a fuse. ☐

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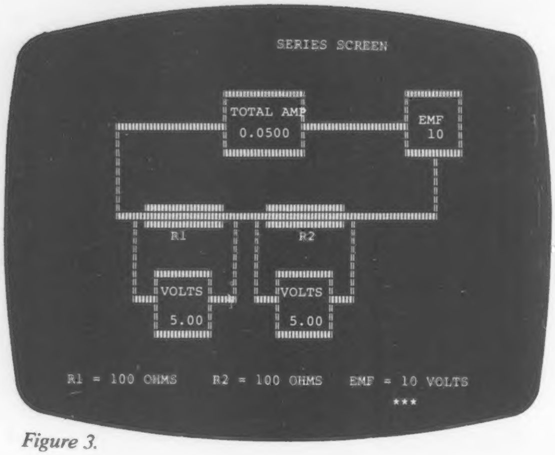

```
R1 = 100 OHMS    R2 = 100 OHMS    EMF = 10 VOLTS
                                      ***
```

Figure 3.

```
1 CLEAR300:CLS:PRINT"CIRCUIT SIMULATION":PRINT"VERSION 3.0":PRINT"WRITTEN BY DAV
ID A. HOLKO":PRINT:PRINT:PRINT
2 C$=STRING$(63," "):B$="##.##":PRINT"1 PARALLEL RESISTANCE CIRCUIT":PRINT"2 SER
IES RESISTANCE CIRCUIT":PRINT"3 PARALLEL & SERIES RESISTANCE CIRCUIT":PRINT:PRIN
T:PRINT"CHOOSE CIRCUIT TYPE";:INPUTX:CLS:ONXGOTO3,26,39:CLS:GOTO2
3 FORT=1TO8:READ A,B,C,D
4 FORX=ATOB:SET(X,C):SET(X,D):NEXTX
5 NEXTT:SET(39,6):SET(39,35)
6 DATA 23,36,11,18,41,54,11,18,28,31,24,29,46,49,24,29
7 DATA 7,20,23,30,57,70,23,30,67,90,2,9,110,123,2,9
8 FORX=10TO36:SET(116,X):NEXTX
9 FORT=1TO15:READ A,B,C,D:FORX=ATOB:SET(C,X):SET(D,X):NEXTX,T
10 DATA 7,11,30,48,19,23,30,48,30,34,30,48
11 DATA 21,22,15,64,31,32,15,64,11,18,23,36,11,18,41,54,23,30,7,20,23,30,57,70,2
4,29,28,29,24,29,30,31,24,29,46,47,24,29,48,49,2,9,67,90,2,9,110,123
12 FORT=1TO9:READ A,B,C:FORX=ATOB:SET(X,C):NEXTX,T
13 DATA 39,67,5,30,48,7,16,30,21,48,63,21,30,48,34,39,116,36,90,110,5
14 DATA 16,29,32,49,63,32
15 FORT=1TO8:READA,A$:PRINT@A,A$;:NEXTT
16 DATA 121,EMF,99,TOTAL AMP,269,AMPS,278,AMPS,517,VOLTS,542,VOLTS,528,(R1,596,R
2)
17 IFR1<=0ORR2<=0ORVT<=0 THENR1=100:R2=100:VT=12:GOTO17ELSEV1=VT:V2=VT:RT=R1*R2/
(R1+R2):IT=VT/RT:V1=VT:V2=VT:I1=V1/R1:I2=V2/R2:PRINT@896,C$;
18 PRINT@165,"";:PRINTUSINGB$;IT;:PRINT@580,"";:PRINTUSING"####";V1;:PRINT@605,"
";:PRINTUSING"####";V2;:PRINT@332,"";:PRINTUSINGB$;I1;:PRINT@341,"";:PRINTUSINGB
$;I2;:PRINT@184,"";:PRINTUSING"###";VT;
19 PRINT@896,"R1 = ";R1;" OHMS";
20 PRINT@920,"R2 = ";R2;" OHMS";
21 PRINT@940,"EMF = ";VT;" VOLTS";
22 FORX=1TO50:PRINT@965,"***";:A$=INKEY$:IFLEN(A$)=0THEN:PRINT@965,"   ";:NEXTXE
LSEIFA$="I"THENR1=R1+10:GOTO22ELSEIFA$="D"THENR1=R1-10:GOTO22
23 FORX=1TO50:PRINT@988,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@988,"   ";:NEXTXEL
SEIFA$="I"THENR2=R2+10:GOTO23:ELSEIFA$="D"THENR2=R2-10:GOTO23
24 FORX=1TO50:PRINT@1008,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@1008,"   ";:NEXTX
ELSEIFA$="I"THENVT=VT+1::GOTO24ELSEIFA$="D"THENVT=VT-1:GOTO24ELSE
25 GOTO17
26 FORX=1TO135:READX$:NEXTX:CLS:FORX=1TO6:READN,N$:PRINT@N,N$:NEXTX
27 DATA 95,TOTAL AMP,122,EMF,407,R1,424,R2,534,VOLTS,551,VOLTS
28 FORX=1TO14:READA,B,C:FORY=ATOB:SET(C,Y):NEXTY,X
29 DATA 2,9,60,2,9,82,2,9,111,2,9,126,10,15,119,7,15,30,17,25,35,17,25,63,17,25,
69,17,25,96,24,29,41,24,29,56,24,29,75,24,29,90
30 FORX=1TO19:READA,B,C:FORY=ATOB:SET(Y,C):NEXTY,X
31 DATA 30,59,6,82,111,6,111,126,2,111,126,9,60,82,2,60,82,9,30,119,16,38,59,15,
38,59,17,72,93,15,72,93,17,35,41,26,41,56,23,41,56,30,56,63,26,69,75,26,90,96,26
,75,90,23,75,90,30
```

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CIRCLE 156 ON READER SERVICE CARD

```
32 IFR1<=0ORR2<=0ORVT<=0THENR1=100:R2=100:VT=10:GOTO32ELSERT=R1+R2:IT=VT/RT:V1=R
1*IT:V2=R2*IT:PRINT@896,C$;
33 PRINT@161,"";:PRINTUSING"#.####";IT;:PRINT@186,"";:PRINTUSING"###";VT;:PRINT@
598,"";:PRINTUSINGB$;V1;:PRINT@615,"";:PRINTUSINGB$;V2;
34 PRINT@896,"R1 = ";R1;" OHMS";:PRINT@920,"R2 = ";R2;" OHMS";:PRINT@940,"EMF =
";VT;" VOLTS";
35 FORX=1TO50:PRINT@965,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@965,"   ";:NEXTXEL
SEIFA$="I"THENR1=R1+10:GOTO35ELSEIFA$="D"THENR1=R1-10:GOTO35
36 FORX=1TO50:PRINT@988,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@988,"   ";:NEXTXEL
SEIFA$="I"THENR2=R2+10:GOTO36ELSEIFA$="D"THENR2=R2-10:GOTO36
37 FORX=1TO50:PRINT@1008,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@1008,"   ";:NEXTX
ELSEIFA$="I"THENVT=VT+1:GOTO37ELSEIFA$="D"THENVT=VT-1:GOTO37
38 GOTO32
39 FORX=1TO246:READX$:NEXTX:
40 FORX=1TO53:READA,B,C:FORY=ATOB:SET(C,Y):NEXTY,X
41 DATA 3,9,18,3,9,33,3,9,98,3,9,99,4,7,101,4,7,102,3,9,104,3,9,105,4,7,107,4,7,
108,3,9,110,3,9,111,4,7,113,4,7,114,3,9,116,3,9,117,4,7,119,4,7,120,5,16,125,16,30,121
42 DATA 26,33,115,26,33,100,24,29,94,20,27,89,20,27,76,24,29,72,30,38,66,35,38,3
0,33,35,35,33,35,25,26,33,43,26,33,32,26,33,29,26,33,18,14,21,61,14,21,48,14,21,13,14,21,0
43 DATA 12,14,55,12,14,35,12,14,25,12,14,6,21,23,55,21,26,35,21,26,25,21,23,6,15
,20,36,15,20,35,15,20,34,15,20,26,15,20,25,15,20,24,9,11,30
44 FORX=1TO31:READA,B,C:FORY=ATOB:SET(Y,C):NEXTY,X
45 DATA 18,33,2,18,33,9,33,97,5,121,125,5,121,125,16,116,121,30,100,115,26,100,1
15,33,66,99,30,89,93,24,72,76,24,76,89,20,76,89,27
46 DATA 74,89,29,74,89,31,30,66,38,25,35,35,18,29,33,18,29,26,32,43,26,35,55,12,
35,55,23,32,43,26,6,24,12,6,24,23,25,35,11,0,12,14,0,12,21,48,60,14,48,60,21,33,43,33
47 FORX=1TO11:READN,N$:PRINT@N,N$;:NEXTX
48 DATA 245,EMF,628,AMPS,321,VOLTS,345,VOLTS,586,AMPS,593,AMPS,407,VOLTS,75,AMPS
,339,<R2,329,R1>,744,R3
49 IFR1<=0ORR2<=0ORR3<=0ORVT<=0THENR1=100:R2=100:R3=50:VT=12:GOTO49ELSERE=R1*R2/
(R1+R2):RT=RE+R3:IT=VT/RT:V3=IT*R3:V2=VT-V3:V1=V2:I1=V1/R1:I2=V2/R2:PRINT@896,C$;
50 PRINT@138,"";:PRINTUSING"##.###";IT;:PRINT@385,"";:PRINTUSINGB$;V1;:PRINT@409
,"";:PRINTUSINGB$;V2;:PRINT@650,"";:PRINTUSING"#.##";I1;:PRINT@657,"";:PRINTUSIN
G"#.##";I2;:PRINT@551,"";:PRINTUSINGB$;V3;:PRINT@691,"";:PRINTUSING"##.###";IT;
51 PRINT@896,"R1=";R1;"OHMS";:PRINT@911,"R2=";R2;"OHMS";:PRINT@926,"R3=";R3;"OHM
S";:PRINT@941,"EMF=";VT;"VOLTS";
52 FORX=1TO50:PRINT@965,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@965,"   ";:NEXTXEL
SEIFA$="I"THENR1=R1+10:GOTO52ELSEIFA$="D"THENR1=R1-10:GOTO52
53 FORX=1TO50:PRINT@980,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@980,"   ";:NEXTXEL
SEIFA$="I"THENR2=R2+10:GOTO53ELSEIFA$="D"THENR2=R2-10:GOTO53
54 FORX=1TO50:PRINT@995,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@995,"   ";:NEXTXEL
SEIFA$="I"THENR3=R3+10:GOTO54ELSEIFA$="D"THENR3=R3-10:GOTO54
55 FORX=1TO50:PRINT@1010,"***";:A$=INKEY$:IFLEN(A$)=0THENPRINT@1010,"   ";:NEXTX
ELSEIFA$="I"THENVT=VT+1:GOTO55ELSEIFA$="D"THENVT=VT-1:GOTO55
56 GOTO49
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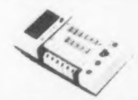

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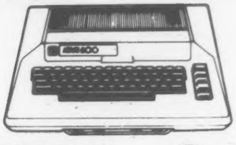

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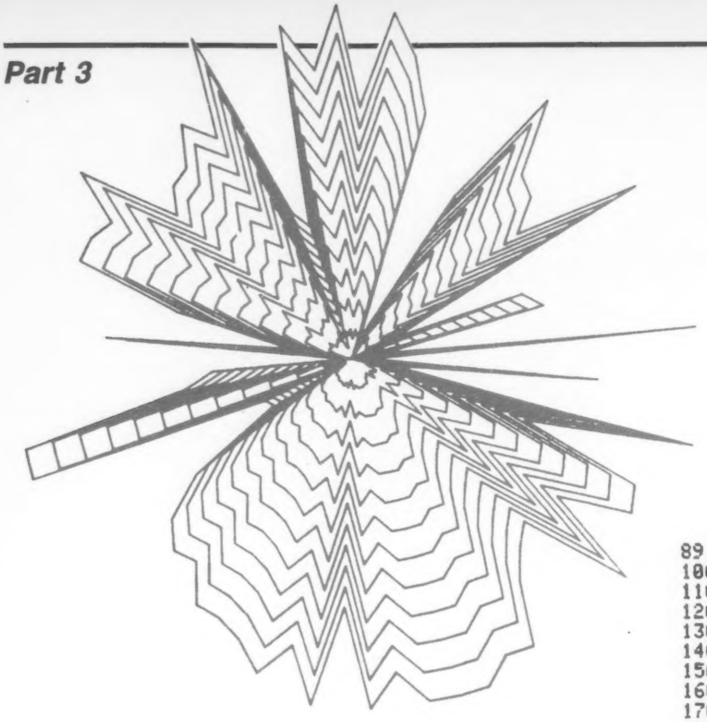
Datalink (D)	$ 27
Space Shuttle (D)	$ 20
Jerry White's Music Lessons (D,C)	$ 20
Swifty Tach Master	(D) $20, (C) $ 17
Apocalypse (D, C)	$ 23
Raptillian (D, C)	$ 23
Kid Grid (D, C)	$ 20
Aliencounter (Face Flash) (D, C)	$ 26
The Jar Game/Chaoe (D, C)	$ 26
Gulp/Arrow Graphics (D, C)	$ 26
Golf Classic/Compubar	$ 26
Frenzy/Flip Flop (D, C)	$ 26
Battling Bugs/Concentration (D, C)	$ 26
Submarine Commander (CT)	$ 34
Jumbo Jet Pilot (CT)	$ 34
Soccer (CT)	$ 34
Kickback (CT)	$ 34
Darts (C)	$ 22
Pool (C)	$ 22
Dominoes and Cribbage (C)	$ 22
Pig Pen (D)	$ 20
Starcross (D)	$ 27
Zork III(D)	$ 27
Journey to the Planets (D, C)	$ 20
Moon Shuttle (D)	$ 27
Moon Patrol (C)	$ 17
Normandie (D, C)	$ 27
Zaxxon (D, C)	$ 27
Juggler (D)	$ 20
Survival of the Fittest	$ 27
Baseball	(D) $23, (C) $ 20
Sentinel I	(D) $23, (C) $ 20
The Guardian of Gorm	(D) $23, (C) $ 20
Miner 2049er (CT)	$ 34
Jeepers Creepers (D)	$ 20
Snapper (D)	$ 20
Twerps (D)	$ 23
Flip Out (D)	$ 20
The Birth of the Phoenix	$ 16
Protector II	(D) $23, (C) $ 29

Part 3



Computer Art for the Tektronix 4052

```
89 REM CORSAGE PROGRAM
100 PAGE
110 PRINT "ENTER D"
120 INPUT D
130 PRINT "ENTER S"
140 INPUT S
150 PRINT "ENTER T"
160 INPUT T
170 W=500*SQR(S↑2+T↑2)
180 SET DEGREES
190 WINDOW -W,W,-W,W
200 GO TO 560
210 PRINT "ENTER T1. T1 MUST BE 1 OR 2."
220 INPUT T1
230 PAGE
240 FOR B=0 TO 360 STEP D
250 FOR A=0 TO 360 STEP G
260 L=ABS(S*SIN(K*A)+T*COS(K*S))
270 GOSUB 390
280 IF T1=2 THEN 310
290 VIEWPORT 22,108,14,100
300 GO TO 320
310 VIEWPORT 15,115,0,100
320 IF A>0 THEN 350
330 MOVE X,Y
340 GO TO 360
350 DRAW X,Y
360 NEXT A
370 NEXT B
380 GO TO 430
390 R=B*ABS(S*SIN(L*A)+T*COS(L*A))
400 X=R*COS(A)
410 Y=R*SIN(A)
420 RETURN
```

Joe Jacobson

In this article I describe my Corsage program. The name stems from the patterns generated, which remind me of assemblages of ribbons and flowers. A Basic source listing and some sample output pictures accompany the text.

This program is a further generalization of my Sinusoidal Loop Programs No. 1 and 2 (*Creative Computing*, January and March, 1983). However, it uses only one polar coordinate function. This function is used to compute the radius as the absolute value of a weighted sum of sinusoids. These sinusoids are, in turn, functions of the angle (A).

An important innovation, which was suggested by my engineering coworker Stuart Boose, is that the angular frequency coefficient L is itself a function of the angle. I used the same type of angular function for L as for the radius. This function itself has an angular frequency coefficient, K, which is entered from the keyboard.

Both the radius function and the L function use the same amplitude coefficients as weights for the sinusoids. These are designated as S and T and are entered from the keyboard.

There are three other parameters that are entered from the keyboard. These are D, G, and T1. D is the increment added to the radius between successive angular sweeps. G is the increment in the angle during an angular sweep. T1 will be discussed below.

When you run the program it places prompts on the screen, asking you to en-

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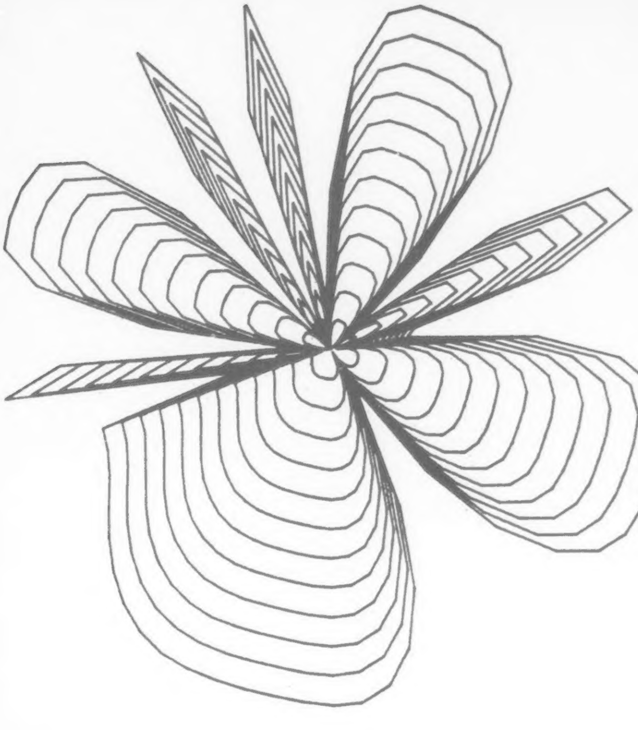

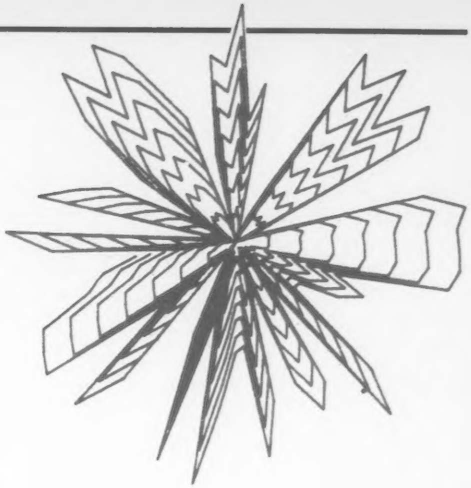

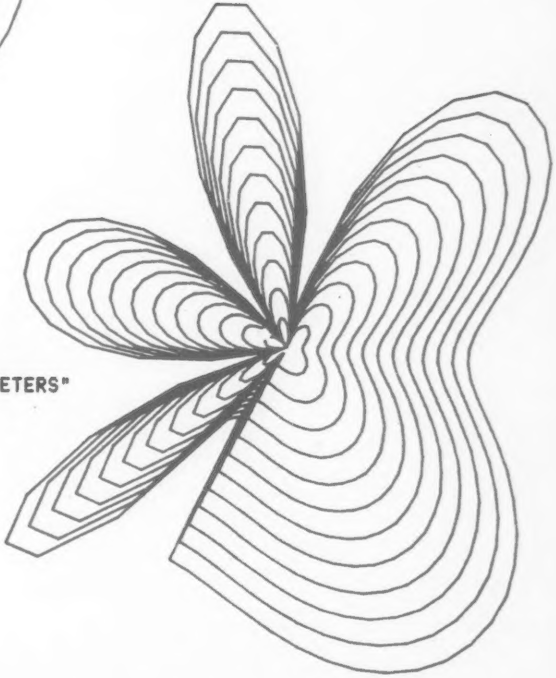

```
430 IF T1=2 THEN 550
440 WINDOW 0,130,0,100
450 VIEWPORT 0,130,0,100
460 MOVE 0,10
470 PRINT "                    CORSAGE PROGRAM PARAMETERS"
480 MOVE 0,5
490 PRINT "                    (D,S,T,K,G) = (";
500 PRINT D;",";S;",";T;",";K;",";G;")"
510 INPUT J$
520 WINDOW -W,W,-W,W
530 T1=2
540 GO TO 230
550 END
560 PRINT "ENTER K"
570 INPUT K
580 PRINT "ENTER G"
590 INPUT G
600 GO TO 210
```

ter values for D, S, T, K, G, and T1. If you enter a 1 for T1, the picture will be plotted and a list of input parameter values will appear below it. Then you clear the screen and hit RETURN, and the same picture will be plotted again without the parameter list. This way you can make hardcopy prints with and without parameters and keep a convenient record of which parameter combinations make good pictures. If you don't want a parameter listing at all, enter a 2 for the value of T1.

Table 1 lists recommended ranges of the values of the input parameters. Values in these intervals seem to give the best results in most cases. However, other values may also yield good pictures; you should experiment with the program to find out which values to use. The parameters D, S, T, K, and G do not have to be integers; decimal fractions like K=29.2 can also work well, and this increases the number of different pictures you can make.

I hope you like the corsage designs. I will describe the other polar coordinate computer art programs I have recently written, in future issues of *Creative Computing*. □

Table 1. Suggested Parameter Values.

Parameter	Range of Values	
	From	To
D	30	50
S	$-\infty$	$+\infty$
T	$-\infty$	$+\infty$
K	6	60
G	5	15
T1*	1	2

*T1 must be 1 or 2.

Part Three

TRS-80 Graphics Made Almost Painless

John Crew

The third in a three-part series, this article describes Graphics Manager, a program that stores whatever is on the screen when it is called. Stored screen images (which I call frames) can be combined, compressed, saved on tape, loaded from tape, and printed on the screen. Graphics characters and ASCII codes can be listed as well. Frames can have either single or double width characters.

The maximum number of frames that can be simultaneously stored in memory depends on the current amount of free string space (frames are stored as strings). The absolute maximum which can be stored is nine because the subroutine which accepts frame numbers uses a single digit. Graphics Manager in Listing 1 clears 6553 bytes of string space which is just enough to hold six frames with single width characters. If some frames are compressed or have double width characters you may be able to store nine frames.

Graphics Manager requires at least 16K of free memory. If you have more, the program will work without modification. The computer for which the programs in this series were written was described in Part 1. You don't need an MX-80 printer unless you want to print frames on paper without modifying the program.

I wrote Graphics Manager to help me design graphics for programs, to manipulate frames, and to provide a means of printing, recording, and loading frames. Graphics Manager can simplify the design of graphics for TRS-80 programs by allowing you to write a graphics creation program with the slow but versatile SET command.

John Crew, 1106 Karin Dr., Normal, IL 61761.

Add Graphics Manager to that slow graphics creation program. Then list ASCII codes to see the character code and screen position of every character. Next, rewrite the graphics creation program using faster techniques such as POKEing character codes or printing strings of graphics characters.

If you have a favorite computer generated picture, Graphics Manager can print it on paper. If you add my Sketch/Print program (January 1983) you can doodle, make cartoons, create art work, or save screens filled with text and graphics.

If you have a favorite computer generated picture, Graphics Manager can print it on paper.

The ability of Sketch/Print and Graphics Manager combined to record screens of text and graphics can be used to create a simple educational program. The teacher would type information on the screen as it would appear to the student. He would then record a series of screen contents on tape. Students would use a stripped-down version of Graphics Manager to load and view the frames.

Because Graphics Manager allows printing of some or all frames in forward or reverse order at a rate controlled by the user, students could review a screenful of information as many times as they liked until they understood and remembered it. A student could also print some frames on paper if he wanted to study them later.

This method of teaching merely uses the computer to replace a book and doesn't take advantage of the ability of the computer to ask and answer questions. This approach might be used to teach young children simple concepts by using graphics and words to present the material.

Mistakes In The Manual

Writing Graphics Manager was complicated by the poorly organized, sometimes unclear, sometimes incorrect, and often too brief Level II manual. The quality of the manual varies from section to section. The more I learned about Level II, the more I appreciated Microsoft Basic and the less I appreciated the manual. I'll mention just a few things the manual doesn't cover.

INPUT won't accept more than 240 characters at once, which should rarely be a problem.

The only place you can use TAB in a PRINT USING statement is between PRINT and USING (the only legal form is PRINT TAB (N) USING . .). When you add or delete lines from a program, Level II moves the rest of the program around as needed so that the pointers to the next line are always in ascending order. PRINT TAB (N) works much like PRINT STRING$(N,“”) for N < 64.

The Edit mode of Level II can be used to find lower case letters.

FRE(“”) can be used instead of something like FRE (“A”) which saves one byte. FRE(0) works the same way as MEM.

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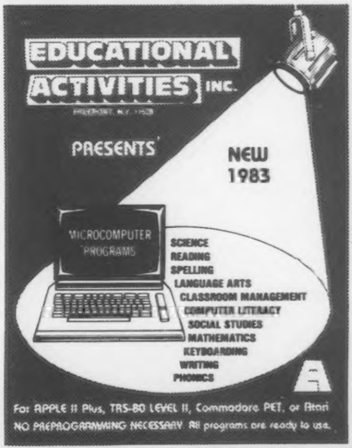

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You can use an arithmetic expression such as ERROR N/10+2 after CLEAR or ERROR. If you use an arithmetic expression after ERROR and you are told there is a syntax error in the line where ERROR appears, don't pay attention to that message.

If you put spaces between GO and TO, they are removed so GOTO is always one word.

When you print a number, Level II won't print it on the current line if there isn't room for the entire number. When you record a string with leading blanks or one which contains a comma or colon, you should record that string with a quotation mark at the front. If you record a string on tape with a quotation mark at the beginning and a quotation mark before the end, you'll get an FD (bad datum in file) error when you try to load it, and only the part of the string between the first and second quotation marks will be loaded.

Using Graphics Manager

An external program that calls Graphics Manager must be added to Graphics Manager for it to work. Graphics Manager appears in Listing 1.

The program doesn't require you to press the ENTER key when you are typing in information. It quickly reacts to the pressing of a key and either accepts or rejects it.

The menu lists all primary options and tells you how much free frame storage is left, permanently reserving 408 bytes for workspace. When you see that 408 or 409 bytes of frame storage remain, only the workspace is left and no more frames can be stored unless you make more room by compressing or erasing some frames. To select one of the options listed in the menu, pfess the key which represents your choice. Next to each letter which represents an option is a short description. If you press a key other than the ones used to represent options, it will be ignored.

Combining two frames may give different results depending on the order of combination.

Storing, compressing, and reversing graphics characters, and uniting two frames are somewhat slow (longer than 10 seconds). Graphics Manager performs these operations visibly so you can tell how near completion they are. As each character in a frame is stored, it is erased on the screen. The reversal of graphics characters and the union of two frames are also performed on the screen so you can see how much has been done.

For every option except the frequently used print option, you are asked to confirm your choice. This enables you to return to the menu if you pressed the wrong key or changed your mind.

Stored frames are referred to by using a number. The number of a frame is between 1 and the count of currently stored frames. When Graphics Manager asks you to enter a frame number, the legal range is printed in parentheses following the request for a number. Some functions ask for one frame number, some ask for two, others ask for the first and last frame numbers for the range of frames.

When you print, erase, compress, save (record on tape), list ASCII codes, or reverse graphics characters, you are asked to enter the starting and final frame numbers of the range of frames you want the function to work on. If the final frame number is greater than the first, you are asked if you want the function done to that range of frames in reverse

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order. You can have reverse order for any of the options listed above. If, for example, you had six frames stored, you could print 1-6, 6-1, 2-4, 3-3, or some other legal range of frames.

Frame Compression

Frame compression is one of the most important features of Graphics Manager and one of the most difficult to implement. It uses the seldom used space compression characters. Substrings of consecutive blanks (ordinary blank, graphics blank, or CHR$ (193)) are replaced by a compression character. Up to 63 blanks can be replaced by a single compression character. When a compression character is printed, it is expanded to a series of blanks. Frames without two or more consecutive blanks within a subframe are unchanged when you try to compress them. If you want to know how many bytes were gained by compression, note the free frame space before and after compression.

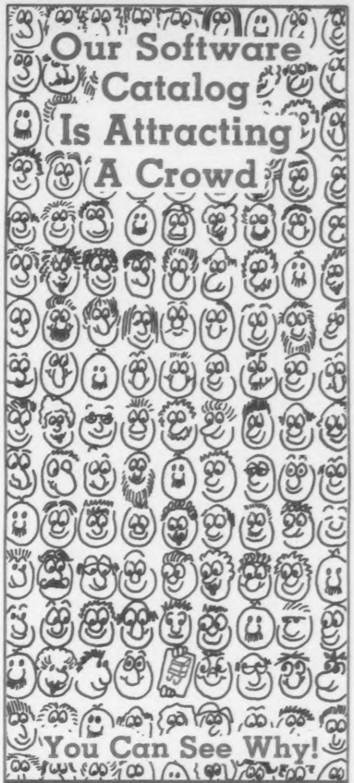
Compressing may give you enough room to store more frames. Printing or combining frames will be much faster if the frames are compressed. Most other parts of Graphics Manager will be slightly faster if some or all frames are compressed. If you want to decompress a frame for some reason, reverse its graphics characters twice. A compressed frame will expand to its original size when its graphics characters are reversed.

Combination Of Frames

Combination of two frames is done by printing the first frame and then merging graphics characters and putting nongraphics characters from the second frame into blank spaces in the first. You could think of combination as putting the second frame behind the first so the

Listing 1. GM (Graphics Manager).

```
0 CLEAR6553:DEFINTA-Z:MF=8:DIMSC$(4,MF),CM(MF):QB$="PRECSGUDTAQL"
:REM *** THIS LINE SHOULD GO BEFORE ANY OTHER TO SET ASIDE THE STORAGE NEEDED BY
 GM. IF THIS ISN'T THE VERY FIRST LINE, AT LEAST MAKE SURE IT IS EXCECUTED BEFOR
E CALLING GM
32049 END
:REM *** THIS PREVENTS A PROGRAM FROM UNEXPECTEDLY ENTERING GM. IF YOU ARE SURE
THAT WON'T HAPPEN, DELETE THIS LINE
32050`GOSUB32680:IFQDTHEN32620ELSEQE=FC:GOSUB32630
:REM IF THERE IS ROOM, STORE THE CURRENT SCREEN'S CONTENTS
32080 REM *** LINES 32090-32100 PRINT THE MENU
32090 CLS:PRINTTAB(13)"GRAPHICS MANAGER BY JOHN CREW 2/3/82
"STRING$(64,143)"A - PRINT ASCII CODES
C - COMPRESS FRAME(S)
D - DUPLICATE A FRAME
E - ERASE FRAME(S)
G - REVERSE GRAPHICS
L - LOAD FRAME(S) FROM TAPE
P - PRINT FRAME(S)
32100 PRINT"Q - QUIT
R - RETURN TO MAIN PROGRAM
S - SAVE FRAME(S) ON TAPE
T - TRADE (SWAP) TWO FRAMES
U - UNITE (COMBINE) TWO FRAMES
"STRING$(64,143)TAB(15)CHR$(27)FRE("")"FREE BYTES OF FRAME STORAGE
COMMAND? ";:GOSUB32680
32110 REM *** LINES 32120-32134 WAIT FOR YOU TO PRESS A KEY, THEN IT IS CHECKED
FOR LEGALITY, AND, IF LEGAL, GM GOES TO THE CHOSEN OPTION. IF YOU TRY TO DO ANYT
HING BESIDES LOAD, QUIT OR RETURN WHEN NO FRAMES ARE STORED, YOU'LL GET AN ERROR
 MESSAGE
32115 REM *** IF YOU TRY TO UNITE OR LOAD FRAMES WHEN FRAME STORAGE IS FULL OR T
HERE ISN'T ENOUGH ROOM, YOU'LL GET AN ERROR MESSAGE. IF YOU TRY TO DUPLICATE FRA
MES, YOU'LL BE TOLD LATER IF THERE IS ENOUGH ROOM OR STORAGE IS FULL
32120 GOSUB32410:QA=ASC(QA$):IFQDANDQA=76THEN32620ELSEIFFC<2AND(QA=84ORQA=85)PRI
NT"
TWO OR MORE FRAMES MUST BE STORED":GOTO32440
32125 REM *** LINES 32130-32134 BRANCH TO THE SELECTED OPTION. IF THERE IS NO MA
TCH, YOU PRESSED AN ILLEGAL KEY SO GM GOES BACK FOR YOU NEXT COMMAND. IF YOU ASK
 FOR LOAD, THE 'ON-GOTO' LIST OF LINE NUMBERS WILL BE EXCEEDED SO THE NEXT LINE
WILL BE EXECUTED
32130 QB=0:FORQE=1TO12:IFQA$=MID$(QB$,QE,1)THENQB=QE:QE=12
32132 NEXT:IFQB=0PRINTCHR$(8);ELSEIFFC=0ANDNOT(QA=76ORQA=82ORQA=81)GOSUB32670:GO
TO32090
32134 ONQB+1GOTO32120,32200,32397,32350,32390,32240,32388,32380,32195,32340,3227
0,32320
32135 REM *** LINES 32195-32399 PERFORM THE OPTIONS. LINES 32400-32690 ARE SUBRO
UTINES COMMONLY USED
32137 REM *** LOAD FRAMES
32140 QA$="LOAD FRAME(S) FROM TAPE":GOSUB32610:IFQDTHEN32090ELSEQD=(FRE("")-408)
/1024:IFQD+FC>MFTHENQD=MF-FC+1
32160 PRINT"
HOW MANY FRAMES DO YOU WANT LOADED";:GOSUB32400:QG=VAL(QA$):IFQG<1THENQE=QG-1ELS
EIFQD<QGTHENQE=QG+FC-2ELSE32190
32170 GOSUB32530:PRINT" ONLY ROOM FOR"QD"MORE FRAME(S)":GOTO32160
32190 PRINT"
INSERT TAPE AND PRESS PLAY BUTTON":GOSUB32550:FORQE=FCTOFC+QG-1:INPUT#-1,CM(QE),
SC$(0,QE):FORQF=1TO4:INPUT#-1,SC$(QF,QE):NEXT:FC=FC+1:PRINT"FRAME #"FC"LOADED":N
EXT:POKE16553,255:GOTO32430
:REM THE POKE STATEMENT CORRECTS THE READ-DATA BUG
32193 REM *** DUPLICATE A FRAME
```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characters in the second frame show through holes in the first. The first frame number you type is the frame which will be printed first. The second is the number of the frame to be combined with the first. A comma is automatically put between the two numbers. The combined frame is stored as a new frame so you can't unite two frames if there isn't enough room to store the result.

Combining two frames may give different results depending on the order of combination. This is because a graphics character in the first frame takes precedence over a nongraphics character in the second, and an alphanumeric character in the first takes precedence over any type of character in the frame.

Combination is faster if the second frame is compressed more than the first. If you want to combine two compressed frames, estimate which is more compressed (the one with the most blank spaces) and type its frame number second. The more compressed frame will be quickly put behind the first.

Quitting

You can, of course, quit when not saving or loading frames by pressing the BREAK key, but I suggest you use the quit option instead. When you use the quit option, all variables are erased and the large amount of string space used by Graphics Manager is released. If the printer is turned on, it is set back to 80 characters per line.

Returning To The Graphics Program

I call the graphics creation program the main program even though Graphics Manager may well be longer and more complex. If you want, Graphics Manager can put a frame on the screen before returning. If the graphics program takes advantage of the ability of Graphics Manager to return a frame, you can modify that frame and then store it if there is room. Sketch/Print or Vector Plotter can modify a frame sent by Graphics Manager.

Warning

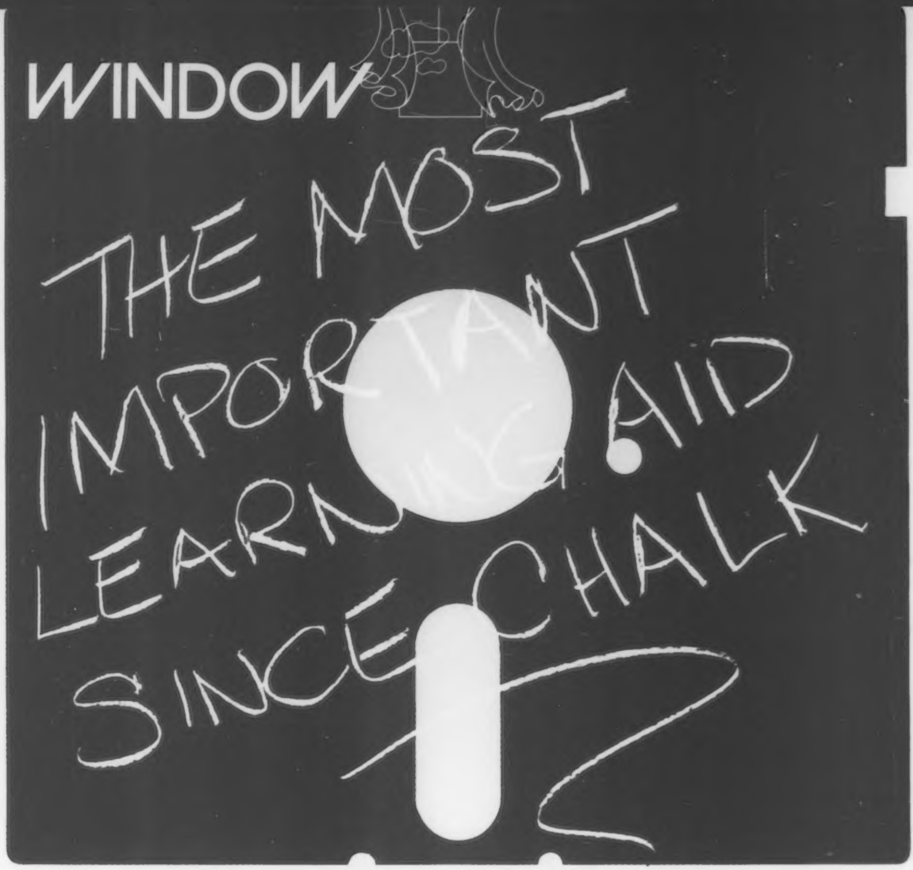
Don't try to save on tape a frame which contains a quotation mark because you will get an FD error when you try to load it. You can store such a frame and do anything except load it properly. This problem is a result of the way Level II handles string input.

Error Checking

Graphics Manager does much error checking to avoid having the program fail because you pressed the wrong key or asked for a function under the wrong circumstances. I tried to do a thorough job of making the program reject erroneous information and print a message

```
32195 QA$="DUPLICATE A FRAME":GOSUB32610:IFQDTHEN32090ELSEQC=6:GOSUB32510:GOSUB3
2690:IFQH<QDORMF<FCTHEN32620ELSEFORQF=0TO4:SC$(QF,FC)=SC$(QF,QE):NEXT:CM(FC)=CM(
QE):FC=FC+1:GOTO32090
32197 REM *** PRINT FRAMES ON THE SCREEN OR ALSO ON A MX-80 PRINTER. WHEN USING
THE MX-80, YOU CAN HAVE NORMAL WIDTH OR COMPRESSED CHARACTER WIDTH. YOU'LL GET A
N ERROR MESSAGE IF THE PRINTER ISN'T READY
32200 CLS:PRINT"PRINT FRAME(S)":GOSUB32490
32210 QA$="COPY ON MX-80":GOSUB32610:QI=QD:PRINT:IFNOTQITHENIFPEEK(14312)<>63THE
NPRINT"PRINTER NOT READY":GOSUB32480:GOTO32210ELSEQA$="COMPRESSED CHARACTERS":GO
SUB32610:IFQDTHENLPRINTCHR$(18);ELSELPRINTCHR$(15);
32220 PRINT"
NOW AND AFTER EACH FRAME IS PRINTED, ";:GOSUB32550:FORQE=QATOQBSTEPQC:GOSUB32590
:IFQITHEN32228ELSELPRINTSTRING$(2,10):FORQF=15360TO16320STEP64:IFCM(QE)=2LPRINTC
HR$(14);
32224 LPRINTSTRING$((4-14*NOTQD)*(3-CM(QE)),32);:FORQG=0TO63STEPCM(QE):QH=PEEK(Q
F+QG):LPRINTCHR$(QH-32*(QH>127));:NEXT:LPRINT:NEXT:LPRINTSTRING$(2,10)
32228 GOSUB32420:NEXT:GOTO32090
32230 REM *** SAVE FRAMES ON TAPE
32240 QA$="SAVE FRAME(S) ON TAPE":GOSUB32610:IFQDTHEN32090ELSEGOSUB32490
32250 REM *** THE 'OUT255,4' STATEMENT IN LINE 32260 TURNS ON THE CASSETTE MOTOR
 (IF THE REMOTE JACK IS PLUGGED INTO THE RECORDER) SO BLANK SPACE IS LEFT AFTER
EACH FRAME
32260 PRINT"ADVANCE TAPE TO A BLANK SPACE":GOSUB32550:FORQE=QATOQBSTEPQC:PRINT#-
1,CM(QE),CHR$(34)SC$(0,QE):FORQF=1TO4:PRINT#-1,CHR$(34)SC$(QF,QE):NEXT:OUT255,4:
PRINT"FRAME #"QE+1"SAVED":GOSUB32480:NEXT:GOTO32430
32265 REM *** LIST ASCII CHARACTER CODES, SCREEN POSITION, AND MEMORY ADDRESS OF
 EACH SCREEN POSITION FOR EVERY CHARACTER IN A FRAME. THIS INFORMATION IS HELPFU
L IN DESIGNING GRAPHICS PROGRAMS USING 'PRINT@' AND/OR 'POKE'
32270 QA$="PRINT ASCII CODES":GOSUB32610:IFQDTHEN32090ELSEGOSUB32490:FORQE=QATOQ
BSTEPQC:CLS:PRINTTAB(27)"FRAME #"QE+1"
SCREEN POSITION"TAB(19)"SCREEN ADDRESS"TAB(38)"CHARACTER"TAB(54)"ASCII CODE"STRI
NG$(64,143);
32290 IFCM(QE)=2THENPRINTTAB(7)"DOUBLE WIDTH CHARACTER MODE (32 CHARACTERS/LINE)
   ONLY EVEN NUMBERED BYTES ARE USED TO STORE THE CHARACTERS"ELSEPRINTTAB(22)"64
 CHARACTERS/LINE
32300 GOSUB32480:QH=0:FORQF=0TO4:FORQG=1TOLEN(SC$(QF,QE)):QA$=MID$(SC$(QF,QE),QG
,1):QD=ASC(QA$):IFQD<>192PRINTUSING"    ####";QH;:PRINTTAB(22)QH+15360;
32303 IF32<QDANDQD<192PRINTTAB(42)QA$;
32304 PRINTTAB(57)USING"###";QD:IF191<QDTHENQD=QD-192ELSEQD=1
32305 QH=QH+CM(QE)*QD:NEXT:NEXT:GOSUB32480:NEXT:GOTO32090
32310 REM *** QUIT (EXIT PROGRAM). THE HUGE AMOUNT OF STRING STORAGE USED BY GM
IS RELEASED AND ALL VARIABLES ARE ERASED. THE PRINTER IS SET TO 80 CHR/LINE IF I
T'S ON
32320 QA$="QUIT PROGRAM":GOSUB32610:IFQDTHEN32090ELSECLEAR50:IFPEEK(14312)<>15PO
KE14312,18
32330 END
:REM *** IF YOU WANT GM TO ERASE ITSELF, CHANGE 'END' TO 'NEW' (WITHOUT QUOTATIO
N MARKS)
32335 REM *** TRADE (SWAP) 2 FRAMES BY EXCHANGING SUBFRAME STRING ADDRESSES
32340 QA$="TRADE TWO FRAMES":GOSUB32610:IFQDTHEN32090ELSEQC=5:GOSUB32570:FORQE=0
TO4:QC=VARPTR(SC$(QE,QA)):QD=VARPTR(SC$(QE,QB)):FORQF=0TO2:QG=PEEK(QC+QF):POKEQC
+QF,PEEK(QD+QF):POKEQD+QF,QG:NEXT:NEXT:QC=CM(QA):CM(QA)=CM(QB):CM(QB)=QC:GOTO320
90
32345 REM *** ERASE FRAMES. THIS RECOVERS THE STORAGE USED BY THE ERASED FRAMES
32350 QA$="ERASE FRAME(S)":GOSUB32610:IFQDTHEN32090ELSEQD=FC-1:GOSUB32490:IFQB<Q
ATHENQC=QA:QA=QB:QB=QC
32360 QC=QB-QA+1:IFQB=QDTHEN32370ELSEFORQE=QATOQD-QC:CM(QE)=CM(QE+QC):FORQB=0TO4
:QF=VARPTR(SC$(QB,QE)):QG=VARPTR(SC$(QB,QE+QC)):FORQH=0TO2:POKEQF+QH,PEEK(QG+QH)
:NEXT:NEXT:NEXT
:REM *** THIS LINE MOVES FRAMES DOWN IN THE ARRAY IF NECESSARY
32370 FORQE=QDTOFC-QCSTEP-1:FORQB=0TO4:SC$(QB,QE)="":NEXT:NEXT:FC=FC-QC:GOTO3209
0
:REM *** THIS LINE ERASES THE FINAL FRAME(S)
32375 REM *** UNITE (COMBINE) TWO FRAMES BY PRINTING THE FIRST, MERGING GRAPHICS
 CHARACTERS AND PUTTING NONBLANK CHARACTERS FROM THE SECOND FRAME INTO CORRESPON
DING BLANK POSITIONS IN THE FIRST
32380 QA$="UNITE TWO FRAMES":GOSUB32610:IFQDTHEN32090ELSEQC=4:GOSUB32570:IFCM(QA
)<>CM(QB)PRINT"
BOTH FRAMES MUST BE THE SAME CHARACTER MODE":GOSUB32480:GOTO32380ELSEIFMF<FCORFR
E("")<1024/CM(QA)+408THEN32620
32382 QE=QA:GOSUB32590:QG=15360:FORQE=0TO4:FORQF=1TOLEN(SC$(QE,QB)):QD=ASC(MID$(
SC$(QE,QB),QF,1)):IF191<QDTHENQH=QD-192:GOTO32386ELSEQH=1:QC=PEEK(QG):IF(QC=32OR
QC=128)AND31<QDANDQD<128POKEQG,QD+32*(95<QD):GOTO32386
32383 IFQC=32QC=128
32384 IFQD=32QD=128
32385 IF127<QCANDQC<192AND127<QDANDQD<192POKEQG,QCORQD
32386 QG=QG+CM(QB)*QH:NEXT:NEXT:GOTO32050
32387 REM *** REVERSE GRAPHICS CHARACTERS WHILE LEAVING OTHER CHARACTERS UNCHANG
ED
32388 QA$="REVERSE GRAPHICS":GOSUB32610:IFQDTHEN32090ELSEGOSUB32490:FORQE=QATOQB
STEPQC:GOSUB32690:IFQH<1024/CM(QE)-QDTHENQD=QB:NEXT:GOTO32620ELSEGOSUB32590:FORQ
F=15360TO16383STEPCM(QE):QG=PEEK(QF):IF127<QGANDQG<192POKEQF,319-QGELSEIFQG=32PO
KEQF,191

32389 NEXT:GOSUB32630:NEXT:GOTO32090
32390 QA$="COMPRESS FRAME(S)":GOSUB32610:IFQDTHEN32090ELSEGOSUB32490:CLS:FQRQE=Q
ATOQBSTEPQC:FORQF=0TO4:QG=1:QI=0:QD=0:PRINT@0,"SUBFRAME POSITION"1:GOSUB32396
:REM *** LINES 32390-32396 COMPRESS FRAMES AND KEEP THE USER INFORMED OF PROGRES
S
32391 QH=ASC(MID$(SC$(QF,QE),QG,1)):PRINT@17,QG" ";:IFQH=32ORQH=128ORQH=193THENQ
D=QD+1:IFQD=1THENQI=QG:GOTO32393ELSEIFQD=63ORQG=LEN(SC$(QF,QE))THENQG=QG+1:GOTO3
2395ELSE32393
:REM *** SEARCH FOR A BLANK. WHEN FOUND, SEARCH FOR NEXT NONBLANK OR END OF STRI
NG
32392 IF1<QDTHEN32395ELSEQD=0
:REM *** THIS LINE IS REACHED WHEN A NONBLANK CHARACTER IS FOUND. IF THE COUNT O
F CONSECUTIVE BLANK CHARACTERS IS GREATER THAN ONE, COMPRESS THOSE BLANKS
```



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```
32393 QG=QG+1:IFLEN(SC$(QF,QE))<QGTHENNEXT:NEXT:GOTO32090ELSE32391
:REM *** REPEAT LOOP UNTIL THE END OF THE LAST SUBFRAME IS REACHED
32395 SC$(QF,QE)=LEFT$(SC$(QF,QE),QI-1)+CHR$(192+QD)+RIGHT$(SC$(QF,QE),LEN(SC$(Q
F,QE))-QG+1):QG=QI:QI=0:QD=0:GOSUB32396:GOTO32393
:REM *** THIS LINE DOES THE ACTUAL COMPRESSION
32396 PRINT@64,"LENGTH OF FRAME"STR$(QE+1)", SUBFRAME"QF+1"="LEN(SC$(QF,QE)):RET
URN
:REM *** TELL USER HOW LONG A SUBFRAME IS. THIS IS USED BEFORE COMPRESSION AND E
ACH TIME THE LENGTH IS CHANGED
32397 QA$="RETURN TO MAIN PROGRAM":GOSUB32610:IFQDTHEN32090ELSEPRINT"
PRINT FRAME BEFORE RETURNING (Y/N)";:GOSUB32400:IFQA$<>"Y"THENQE=-1:CLSELSEIFFC=
0THENGOSUB32670:QE=-1:CLSELSEQC=3:GOSUB32510:GOSUB32590
:REM *** PUT FRAME ON SCREEN IF ASKED
32399 RETURN
:REM THIS LINE SENDS GM BACK TO THE GRAPHICS CREATION PROGRAM
32400 PRINT"? ";
:REM *** PRINT PROMPT. LINE 32400-32425 GET A CHARACTER FROM THE KEYBOARD. THIS
SUBROUTINE IS USED FREQUENTLY IN GM
32410 PRINTCHR$(95);
:REM *** PRINT CURSOR. ANOTHER CHARACTER COULD BE USED AND PROBABLY SHOULD BE SO
 YOU CAN TELL BY LOOKING AT THE CURSOR THAT A INKEY$ SUBROUTINE IS BE RUN
32420 QA$=INKEY$
:REM *** THIS MAKES THE COMPUTER 'FORGET' ANY KEYS PRESSED BEFORE REACHING THIS
LINE
32425 QA$=INKEY$:IFQA$<" "THEN32425ELSEPRINTCHR$(8)QA$;:RETURN
32427 REM *** LINES 32430-32440 TELL THE USER WHEN LOADING OR RECORDING OF FRAME
S IS DONE
32430 CLS:PRINTCHR$(23):PRINT@538,"DONE"
32440 GOSUB32480:GOTO32090
32470 REM *** LINE 32480 IS A DELAY SUBROUTINE
32480 FORQD=0TO1400:NEXT:RETURN
32485 REM *** LINES 32490-32500 GET THE STARTING AND FINAL FRAME NUMBERS FOR A R
ANGE OF FRAMES
32490 QC=1:GOSUB32510:QA=QE:QC=2:GOSUB32510:QB=QE:PRINT:QC=SGN(QB-QA):IFQC=0THEN
QC=1ELSEIFQC<0THENPRINT" YOU WANT REVERSE ORDER (Y/N)";:GOSUB32400:PRINT:IFQA$<>
"Y"THEN32490
32500 RETURN
32505 REM *** LINES 32510-32520 ARE A MULTIPURPOSE MESSAGE AND FRAME NUMBER ENTR
Y SUBROUTINE. THIS COMPLICATES THE PROGRAM BUT SAVES MEMORY
32510 PRINT:IFQC<4THEN32514ELSEIFQC=6THENPRINT"# OF FRAME TO BE DUPLICATED";ELSE
PRINT"#'S OF 2 FRAMES TO BE ";:IFQC=4THENPRINT"COMBINED";ELSEPRINT"TRADED";
32511 GOTO32520
32514 IFQC=1PRINT"START";ELSEIFQC=2PRINT"END";ELSEPRINT"PRINTING AND RETURN";
32515 PRINT"ING WITH FRAME #";
32520 PRINT" (1-"STR$(FC)")";:GOSUB32400:QE=VAL(QA$)-1:IFQE+1>FCORQE<0GOSUB32530
:GOTO32510ELSERETURN
32525 REM *** LINES 32530-32540 ARE AN ERROR MESSAGE SUBROUTINE USED WHEN AN ILL
EGAL FRAME NUMBER IS ENTERED
32530 PRINT"
 FRAME #"FC"IS THE LAST
 NUMBER IS TOO ";:IFQE<0PRINT"SMALL"ELSEPRINT"LARGE
32540 RETURN
32545 REM *** LINE 32550 IS A PAUSE SUBROUTINE
32550 PRINT"PRESS ANY BUT A CONTROL
KEY TO CONTINUE";:GOSUB32400:PRINT:RETURN
32560 REM *** LINES 32570-32580 ACCEPT TWO FRAME NUMBERS. THIS SUBROUTINE IS USE
D BY THE UNITE FRAMES & TRADE FRAMES OPTIONS. A COMMA IS AUTOMATICALLY PUT BETWE
EN THE TWO FRAME NUMBERS YOU TYPE
32570 GOSUB32510:QA=QE:PRINT",";
32580 GOSUB32410:QB=VAL(QA$)-1:IFQB+1>FCORQB<0THENQE=QB:GOSUB32530:PRINT"ENTER 2
ND FRAME #? ";:GOTO32580ELSERETURN
32585 REM *** LINES 32590-32605 PRINT A FRAME
32590 CLS:IFCM(QE)=2PRINTCHR$(23);
32600 FORQF=0TO3:PRINTSC$(QF,QE);:NEXT:PRINTLEFT$(SC$(4,QE),LEN(SC$(4,QE))-1);:Q
G=ASC(RIGHT$(SC$(QF,QE),1)):IF32<QGANDQG<192POKE16384-CM(QE),QG+32*(95<QGANDQG<1
28)
32605 RETURN
32607 REM *** LINE 32610 ASKS THE USER TO CONFIRM HIS CHOICE OF THE DIFFERENT OP
TIONS WHICH GM OFFERS
32610 CLS:PRINTQA$" (Y/N)";:GOSUB32400:QD=QA$<>"Y":RETURN
32615 REM *** LINES 32620-32625 ARE USED WHEN NO MORE FRAMES CAN BE STORED. IF F
EWER THAN 9 FRAMES ARE STORED BUT THERE ISN'T ENOUGH STRING SPACE TO HOLD A FRAM
E, YOU'RE TOLD THERE IS 'INSUFFICIENT STORAGE'
32616 REM *** IF 9 FRAMES ARE STORED, YOU'RE TOLD 'FRAME STORAGE IS FULL'
32620 PRINT:IFMF<FCPRINT"FRAME STORAGE SPACE IS FULL"ELSEPRINT"INSUFFICIENT STOR
AGE"
32625 GOSUB32550:GOTO32090
32627 REM *** LINE 32630-32664 STORE A FRAME
32630 QD=15360:CM(QE)=1+PEEK(16445)/8:ONERRORGOTO32664:QH=CM(QE)-1:FORQF=0TO4:SC
$(QF,QE)=STRING$((205-QH-(CM(QE)=2))/CM(QE),32):QI=VARPTR(SC$(QF,QE)):QI=PEEK(QI
+1)+256*PEEK(QI+2)+65536*(127<PEEK(QI+2)):FORQG=QH+1TO205STEPCM(QE):POKEQI,PEEK(
QD):QI=QI+1:POKEQD,32
32640 QD=QD+CM(QE):NEXT:IFCM(QE)=2OR(CM(QE)=1ANDQF=3)THENQH=1-QH
32650 NEXT:IFFC=QETHENFC=FC+1:RETURNELSERETURN
32664 IFERR=10ANDERL=32630THENQI=QI-65535:RESUMENEXTELSEONERRORGOTO0:
REM USED WHEN KEYBOARD/EXPANSION INTERFACE MEMORY BOUNDARY IS CROSSED
32669 REM *** LINE 32670 PRINTS AN ERROR MESSAGE
32670 PRINT"
FRAME STORAGE IS EMPTY":GOSUB32480:RETURN
32675 REM *** LINE 32680 EVALUATES A LOGICAL EXPRESSION WHICH CHECKS TO SEE IF A
 FRAME CAN BE STORED
32680 QD=MF<FCORFRE("")<1024/(PEEK(16445)/8+1)+408:RETURN
32685 REM *** LINE 32690 CALCULATES THE LENGTH OF A FRAME AND CALCULATES THE AMO
UNT OF STRING STORAGE WHICH CAN BE USED FOR STORING FRAMES
32690 QD=0:FORQF=0TO4:QD=QD+LEN(SC$(QF,QE)):NEXT:QH=FRE("")-408:RETURN
```

when it detects an error. Depending on the error and where it occurs, Graphics Manager will either go to the menu or repeat the question you answered incorrectly.

If you ask for any option other than load, return, or quit when no frames are stored, the program will tell you that frame storage space is empty. If you try to store, load, duplicate, or unite two frames when nine frames are stored, the program says frame storage space is full. If there are fewer than nine frames stored and too little memory to hold another frame when you try to do one of the four things just listed, Graphics Manger will tell you that frame space is insufficient to store a frame.

If you ask Graphics Manager to print frames on paper, it checks the printer. If the printer isn't on-line, the program says the printer isn't ready and then asks you again if you want frames printed on the MX-80.

You also get an error message if you try to combine two frames which have different width chacters. Whenever you enter a frame number, Graphics Manager checks to see if it is in the proper range.

Adding Graphics Manager To Another Program

Figure 1 lists the steps you should follow to append Graphics Manager to another program you have recorded separately. These instructions are for a Level II cassette system but should work for most related systems. The program to which Graphics Manager is to be added should have line numbers greater than 0 and less then 32049. You can have line numbers greater than 32690 but those lines will have to be either typed after Graphics Manager has been added or appended to the combination of Graphics Manager and the low-numbered lines of the graphics creation program.

The common method of merging programs in Figure 1 works by setting the address of the beginning of Basic program storage to the address of the end of the program in memory. That moves the beginning of Basic program storage to just after your program so CLOAD, NEW, and LIST won't affect your hidden program. Graphics Manager is loaded next.

Line 0 of Graphics Manager is listed just so you can see it if you don't have a printed copy handy. Next, line 0 is deleted. Then the beginning of Basic program storage is set to its previous value (which you should have written down after step 3). Finally, line 0 is retyped so it is put before the graphics creation program.

The graphics program you combine with Graphics Manager must leave 408

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Multiplexor for your Hard Disk

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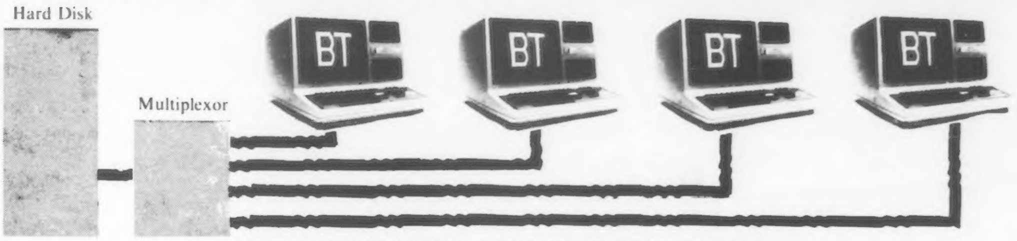

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bytes of string storage. If you use an ON ERROR GOTO statement in your graphics program, you must execute that statement every time you return from Graphics Manager because the program uses an error handling subroutine. Don't use any of the following variables: FC%, MF%, QB$, SC$ (0-4, 0-MF%), or CM%(0-MF%).

Figures 2 and 3 give complete instructions for adding Sketch/Print or Vector Plotter. Figures 2 and 3 refer to the merging process described in Figure 1. If you add Graphics Manager to Sketch/Print as shown, you can go to Graphics Manager and store a frame at any time after the instructions by pressing the ENTER key, or if you want to go straight to the menu, press the SHIFT and ↑(escape code) keys. The SHIFT, ↑, and ENTER keys are used the same way if you combine Vector Plotter and Graphics Manager as shown, but you must wait for all vectors to be drawn before those keys are recognized.

Calling The Program

To add Graphics Manager to one of your own programs, you need to know how to get to Graphics Manager and

Graphics Manager is written entirely in Basic.

Figure 1. Merging Graphics Manager with Another Program.

Do the following in the command mode:

1. `CLOAD` first program
2. `FIN=16633: ST=16548`
3. `PRINT PEEK(ST); PEEK(ST+1).` Write down the two numbers printed
4. `BRW=PEEK(FIN)<2: POKE ST, PEEK(FIN)-2-256*BRW: POKE ST+1, PEEK(FIN+1)+BRW`
5. `CLOAD` Graphics Manager
6. `LIST 0`
7. `DELETE 0`
8. `POKE` at `16548` and `16549` the two numbers printed in step 3
9. Retype line `0`

Figure 2. Adding Graphics Manager to Sketch/Print

1. Merge programs
2. Remove `CLEAR2: DEFINTA-Z:` in line `100`
3. Insert `IFN=13ANDS=0,32050ELSEIFN=27,32090 ELSE` at the beginning of line `185`
4. Change line `32399` to `32399 GOTO160`

Figure 3. Adding Graphics Manager to Vector Plotter.

1. Merge programs
2. Change line `360` to `360 QA$=INKEY$:IFQA$=CHR$(13)THEN32050ELSEIFQA$=CHR$(27)THEN32090ELSE360`
3. Change line `32399` to `32399 GOTO110`
4. Remove `CLEAR12:DEFINTA-Z:` in line `100`
5. Add `:B$=""` after `NEXT` in line `350`
6. Insert `IFQE>=0GOSUB32590ELSE` before `CLS` in line `230`
7. Add `:QE=-1` to end of line `100`

Figure 5. Bytes of String Spaces Required for an Uncompressed Frame.

	Subframe Number				
Character width	1	2	3	4	5
Single	205	205	205	205	204
Double	102	103	102	103	102

Figure 4. Variables used by Graphics Manager.

Type	Name	Main Use(s)
Integer	MF	(Maximum number of frames)-1.
	FC	The count of stored frames.
	QA	Number of first frame of range.
	QB	Frame number of final frame in range.
	QC	Increment for loop which processes a range of frames.
	QD	Number of consecutive blanks during compression. Loop counter in delay subroutine. Used to pass a value from main to subroutines and vice versa.
	QE	Loop counter for frame numbers.
	QF	Loop counter for subframe numbers.
	QG	ASC (final character in frame) when printing frames, reversing graphics. Position in subframe during compression.
	QH	ASC (character in frame) when listing ASCII codes, copying a frame on the MX-80, and compressing frames.
	QI	Compressed character flag when using MX-80. VARPTR (SC$(QF,QE)). Address of position in string during frame storage. Position of first blank in subframe during compression.
	CM(0→MF)	Character display mode for each frame. 1 for single width, 2 for double width.
Character string	QA$	Character entered by user, message sent to selection confirmation subroutine.
	QB$	String of letters which represent program options.
	SC$(0→4,0→MF)	Screen character storage; holds frames.

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back. This can be done in either of two ways: You can use GOSUB to jump to Graphics Manager and RETURN to get back, or you can use GOTO to get back. If you enter Graphics Manager at line 32050, the current screen contents will be stored if there is room. If you want to go directly to the menu, enter Graphics Manager at line 32090. Line 32399 contains the statement which goes back to the graphics creation program.

General Design

Graphics Manager is written entirely in Basic. It is very compact, and, I hope, efficient. It doesn't use any READ or DATA statements, so you can use them in your own graphics creation program without problems. It uses as few variables as practical. It also uses integer variables for storing numbers, because they use less memory and arithmetic is faster using them. I tried to use variable names which you probably wouldn't use in your graphics program.

Figure 4 lists all the variables used in Graphics Manager along with a short description of the use(s) of each. The variables QA, QB, QC, . . . QI are used for a variety of short-term purposes. You may use QA-QI in the graphics creation program, and if speed is your goal, you should use those variables to minimize the time spent by Level II looking through the variable storage area.

Graphics Manager uses zero positions in arrays so memory isn't wasted. The user isn't aware of this since frame numbers go from 1 to the count of stored frames.

Listing 2. Lines which can be added to GM to test GM.

```
10 FORI=1TO10:CLS:IFI/2=FIX(I/2)THENFORQE=0TO127:QF=.370079*QE:SET(QE,QF):SET(QE
,47-QF):SET(QE,0):SET(QE,47):NEXT:FORQE=0TO47:SET(0,QE):SET(127,QE):NEXT:PRINT@3
1,I;:GOTO30
15 IFI/3=FIX(I/3)THENFORQE=1TO7:PRINTSTRING$(128,152);:NEXT:PRINTSTRING$(127,152
);:POKE16383,152:PRINT@31,I;:PRINT@667,CHR$(34)"  THIS FRAME CONTAINS QUOTATION
MARKS"CHR$(34);:GOTO30
16 IFI/5=FIX(I/5)THENPRINTCHR$(23);:FORQE=1TO15:PRINTSTRING$(32,178);:NEXT:PRINT
STRING$(31,178);:POKE16382,178:PRINT@30,I;:GOTO30
20 PRINTCHR$(23);:FORQE=1TO7:PRINTSTRING$(32,32)STRING$(32,146);:NEXT:PRINTSTRIN
G$(32,128)STRING$(31,146);:POKE16382,146:PRINT@30,I;:PRINT@64,CHR$(34)"THIS FRAM
E CONTAINS QUOTATION MARKS"CHR$(34);
30 GOSUB32050
40 NEXTI
```

Listing 3. Assembly Language version of subframe store and scan subroutines.

```
                00100 ;         SUBFRAME STORE, SUBFRAME SCAN (STOSCN)
                00110 ;                 BY JOHN CREW
                00120 ;                 62 BYTES LONG WHEN ASSEMBLED
                00130 ;                 DATE 1/5/82
                00140 ;
                00150 ;*******************************************************
                00160 ;SUBFRAME STORE SUBROUTINE
                00170 ;
                00180 ;REGISTER          USE(S)
                00190 ;
                00200 ; A               CHR MODE INDICATOR, CHR FROM SCREEN, LSB OF
                00210 ;                 SCREEN ADDRESS
                00220 ; B               LEN(SC$(QF,QE))
                00230 ; C               INCREMENT FOR SCREEN ADDRESS
                00240 ; DE              ADDRESS OF LOCATION IN SC$(QF,QE)
                00250 ; HL              VARPTR(SC$(QF,QE)), CURRENT SCREEN ADDRESS
                00260 ;*******************************************************
7FC2            00270           ORG     32767-61        ;(TOP OF 16K MEMORY)-61
7FC2 003C       00280 SCRADD    DEFW    15360           ;THIS WILL BE POKED BY GM
                00290           ;DETERMINE WHETHER SINGLE OR DOUBLE WIDTH CHARACTER
                00300           ;ARE BEING DISPLAYED
7FC4 3A3D40     00310           LD      A,(16445)       ;GET CHR MODE INDICATOR
7FC7 0E01       00320           LD      C,1             ;LOAD DEFAULT INCREMENT FOR
                00330                                   ;SCREEN ADDRESS
7FC9 B7         00340           OR      A               ;SET FLAGS
7FCA 2801       00350           JR      Z,CONT1         ;JUMP IF SNG WIDTH CHRS
7FCC 0C         00360           INC     C               ;MAKE INCR 2 INSTEAD OF 1
7FCD 2A2141     00370 CONT1     LD      HL,(16673)      ;GET VARPTR(SC$(QF,QE))
7FD0 46         00380           LD      B,(HL)          ;GET LEN(SC$(QF,QE))
7FD1 23         00390           INC     HL
7FD2 5E         00400           LD      E,(HL)          ;GET LSB OF STRING ADDRESS
7FD3 23         00410           INC     HL
7FD4 56         00420           LD      D,(HL)          ;GET MSB OF STRING ADDRESS
7FD5 2AC27F     00430           LD      HL,(SCRADD)     ;GET CURRENT SCREEN ADDRESS
                00440 ;FILL ONE SUBFRAME WITH CHARACTERS FROM THE SCREEN
7FD8 7E         00450 STORE     LD      A,(HL)          ;GET CHR FROM SCREEN
7FD9 3620       00460           LD      (HL),32         ;ERASE CHR ON SCREEN
7FDB 12         00470           LD      (DE),A          ;STORE CHR IN SC$(QF,QE)
                00480           ;INCREMENT SCREEN ADDRESS
7FDC 7D         00490           LD      A,L             ;GET LSB OF SCREEN ADDRESS
7FDD 81         00500           ADD     A,C             ;INCREMENT LSB OF ADDRESS
7FDE 3001       00510           JR      NC,CONT2
7FE0 24         00520           INC     H               ;ADD 1 TO H BECAUSE OF CARRY
```

How The Program Works

Frames are stored in an array called SC$ (screen characters). Level II allows character strings to be a maximum of 255 characters long. A frame with single width characters uses 1024 bytes of string memory so it must be stored as five strings (which I call subframes). A frame with double width characters takes 512 bytes, so it could be stored in three strings, but I had Graphics Manager store it in five strings so the program would be simpler. Figure 5 shows how characters are distributed among the five strings in each frame.

A subframe is stored by first reserving the needed space by assigning a string of blanks to that subframe using the STRING$ instruction. Then characters are PEEKed from video memory and POKEd into string memory. This method is fast because it minimizes string space reallocation (also known as garbage collection).

When a frame is compressed, each subframe is compressed by itself and no characters are moved from one subframe to another. The first blank is searched for, and, if there is a blank, the next nonblank character or the end of the string is searched for. If there is a substring of two or more consecutive blanks in a subframe, it is replaced by a space compression character.

Frames are moved by copying string addresses and lengths so no physical movement of characters is done.

Frame erasure releases the memory used by the erased frames. If you want a range of frames which includes the final frame erased, then erasure is done by assigning a null string to each subframe of each frame to be erased. If you want some beginning frames erased but not the final frames, then the final frames are moved down over the frames to be erased.

Frames are moved by copying string addresses and lengths so no physical movement of characters is done. That method of moving strings is fast and avoids an OS (out of string space) error when space is tight and a long string is assigned to a variable which held a short string. After moving down any strings which need to be moved, the indicated number of final frames are erased.

TRS-80 Graphics, continued...

If you are still confused by the method used to erase frames, consider this example. Suppose you have seven frames stored and you want 4 and 5 erased. The range of frames you want erased doesn't include the final frame, so frames 6 and 7 must be moved down over 4 and 5 respectively. At this point 4 is the same as 6 and 5 is the same as 7. You wanted two frames erased, so two frames at the end are erased. The count of stored frames is reduced by two. The result is as if frames 4 and 5 were taken out.

Trading (swapping) two frames is done by exchanging string addresses and lengths.

Duplication of a frame is done by assigning the subframe of the frame being copied to an end location in the frame storage array. You can't copy a frame if there isn't room to hold the copy.

I didn't copy a frame by copying string addresses and lengths because I was afraid Level II would later make an actual copy of the string. I experimented a little with copying a string by setting the pointer and length of the second string to the pointer and length of the first and found Level II won't make an actual copy when it does garbage collection.

I suspect that if two strings have the same pointer and length and you use the name of one of those strings anywhere in an assignment statement, an actual copy of the original string will be made. I didn't use that method because I didn't know if it worked under all circumstances. I leave it to you to experiment with that method. If it works, you could easily change Graphics Manager to copy frames that way.

Unlike some graphics reversal subroutines I have seen, mine is fast, efficient, and doesn't disturb nongraphics characters. A blank space or graphics blank is replaced by a completely white graphics character.

I had an odd problem with line 32388 in the program. Sometimes extra characters would appear at the end. This problem seems to occur when a line of about 250 characters is listed after a line of 255 characters. I think Level II doesn't clear the output buffer after listing a very long line so the next long line gets some characters from the previous one.

When this problem occurs, remove the unwanted characters from the line in which they appear using the edit mode. Then list a short line. Next list the line which had extra characters and you should see only the desired characters in that line. To avoid the problem, either use short lines or don't list the program unless you are willing to go through the corrective steps mentioned before.

In a few places Graphics Manager

```
7FE1 6F          00530 CONT2    LD      L,A                 ;PUT NEW LSB IN L
                 00540          ;ADJUST DESTINATION POINTER AND COUNTER
7FE2 13          00550          INC     DE                  ;INC POINTER TO SC$(QF,QE)
7FE3 10F3        00560          DJNZ    STORE
7FE5 22C27F      00570          LD      (SCRADD),HL         ;STORE SCREEN ADDRESS
7FE8 C9          00580          RET                         ;RETURN TO BASIC
                 00590 ;*********************************************************
                 00600 ;SUBFRAME SCAN SUBROUTINE
                 00610 ;
                 00620 ;REGISTER        USE(S)
                 00630 ;
                 00640 ; A              CHR BEING SEARCHED FOR (A QUOTATION MARK)
                 00650 ; BC             LEN(SC$(QF,QE))
                 00660 ; DE             ADDRESS OF SC$(QF,QE), VARPTR(SC$(QF,QE))+2
                 00670 ; HL             VARPTR(SC$(QF,QE)), ADDRESS OF SC$(QF,QE), A
                 00680 ;                0 IS PUT IN HL IF A QUOTATION MARK IS FOUND
                 00690 ;                OTHERWISE A NONZERO NUMBER IS LEFT IN HL
                 00700 ;*********************************************************
7FE9 2A2141      00710 SCAN     LD      HL,(16673)          ;GET VARPTR(SC$(QF,QE))
7FEC 0600        00720          LD      B,0
7FEE 4E          00730          LD      C,(HL)              ;BC HOLDS LEN(SC$(QF,QE))
7FEF 23          00740          INC     HL
7FF0 5E          00750          LD      E,(HL)              ;GET LSB OF STRING ADDRESS
7FF1 23          00760          INC     HL
7FF2 56          00770          LD      D,(HL)              ;GET MSB OF STRING ADDRESS
7FF3 EB          00780          EX      DE,HL               ;PUT STRING ADDRESS IN HL
7FF4 3E22        00790          LD      A,34                ;ASCII FOR QUOTATION MARK
7FF6 EDB1        00800          CPIR
7FF8 2003        00810          JR      NZ,GOBACK           ;JUMP IF NOT FOUND
7FFA 210000      00820          LD      HL,0000H            ;INDICATE IT WAS FOUND
7FFD C39A0A      00830 GOBACK   JP      2714                ;RETURN RESULT TO BASIC
0000             00840          END
00000 TOTAL ERRORS

CONT1    7FCD
CONT2    7FE1
GOBACK   7FFD
SCAN     7FE9
SCRADD   7FC2
STORE    7FD8
```

Listing 4. Relocating Basic loader for subframe store and scan Machine Language subroutines.

```
5 CLS:  PRINT"RELOCATING LOADER FOR STORE & SCAN MACHINE LANGUAGE SUBROUTINES":P
RINTTAB(24)"BY JOHN CREW":PRINTTAB(27)"1/6/82"
10 CLEAR 300: DEFSNG E:  DEFINT L, M:  PRINT: INPUT"ENTER MEMORY SIZE (IF YOU DO
N'T WANT IT TO BE 32706)";A$: IFVAL(A$)=0 THEN E=32706-2 ELSE E=VAL(A$)-2
20 GOSUB 95:  POKE16561,LSB:  POKE16562,MSB:  CLEAR6553:  REM SET MEMORY SIZE AN
D SET ASIDE STRING STORAGE
30 E=PEEK(16561)+256*PEEK(16562)+2:  PRINT "MEMORY SIZE =" E:   E=E+2:  GOSUB 95
:  E=E-2:  PRINT:  PRINT "ADD THIS TO THE BEGINNING OF LINE 32630 IN GM:":  PRIN
TTAB(10)"POKE16526," LSB ":POKE16527,"MSB
40 S=0: FOR I=E TO E+61:  READ N:  S=S+N:  GOSUB 105:  NEXT:  IF S<>4481 THEN CL
S: PRINT"THE SUM OF THE DATA IS SUPPOSED TO BE 4481; NOT"S: END:  REM POKE MACHI
NE LAGUAGE PROGRAM INTO BEGINNING OF RESERVED MEMORY
50 GOSUB 95: I=E+20:  GOSUB 100: I=E+36:  GOSUB 100: REM ADJUST TWO MEMORY REFER
ENCES IN MACHINE LANGUAGE PROGRAM
60 PRINT:  PRINT"MACHINE LANGUAGE PROGRAM HAS BEEN POKED INTO MEMORY STARTING AT
 LOCATION" STR$(E)"."
70 PRINT:  PRINT"PREPARE GRAPHICS MANAGER FOR LOADING.
PRESS ANY KEY EXCEPT 'BREAK' WHEN YOU ARE READY TO LOAD GM."
80 A$=INKEY$
90 IF INKEY$=""THEN 90 ELSE PRINTTAB(22)">> NOW LOADING <<": CLOAD
95 MSB=INT(E/256):  LSB=E-256*MSB:  RETURN
100 N=LSB:  GOSUB105:  I=I+1:  N=MSB:  GOSUB105:  RETURN: REM POKE UPDATED ADDRE
SSES FOR A LOAD INSTRUCTION
105 POKE I+65536*(32767<I), N: IF N><PEEK(I+65536*(32767<I)) THEN PRINT: PRINT"E
RROR:  DATUM WASN'T STORED": CLEAR: END ELSE RETURN
110 DATA    0, 60, 58, 61,   64, 14, 1, 183,    40, 1, 12, 42
120 DATA   33, 65, 70, 35,   94, 35, 86, 42,   196, 127, 126,54
130 DATA 32, 18, 125, 129,   48, 1, 36, 111,   19, 16, 243, 34
140 DATA196, 127, 201, 42,   33, 65, 6,  0,    78, 35, 94, 35
150 DATA  86, 235, 62, 34,   237,177, 32, 3,   33, 0, 0, 195
160 DATA  154, 10
```

Listing 5. Lines in GM which are modified to use the two Machine Language subroutines.

```
32240 QA$="SAVE FRAME(S) ON TAPE":GOSUB32610:IFQDTHEN32090ELSEGOSUB32490:POKE165
26,233:POKE16527,127:FORQE=QATOQBSTEPQC:FORQF=0TO4:IFUSR(SC$(QF,QE))=0THENPRINT"
FRAME"QE+1"CONTAINS A QUOTATION MARK AND WOULDN'T LOAD RIGHT":QE=QB:NEXTQE:GOTO3
2440

32260 NEXT:NEXT:PRINT"ADVANCE TAPE TO A BLANK PLACE":GOSUB32550:FORQE=QATOQBSTEP
QC:PRINT#-1,CM(QE),CHR$(34)SC$(0,QE):FORQF=1TO4:PRINT#-1,CHR$(34)SC$(QF,QE):NEXT
:OUT255,4:PRINT"FRAME #"QE+1"SAVED":GOSUB32480:NEXT:GOTO32430

32630 POKE16526,196:POKE16527,127:CM(QE)=1+PEEK(16445)/8:POKE32706,0:POKE32707,6
0:QH=CM(QE)-1:FORQF=0TO4:SC$(QF,QE)=STRING$((205-QH-(CM(QE)=2))/CM(QE),32):QA$=U
SR(SC$(QF,QE)):IFCM(QE)=2OR(CM(QE)=1ANDQF=3)THENQH=1-QH
```

ends a loop early because some special condition is detected. This is done by setting the loop index to its final value and then executing a NEXT for that loop. This is done in line 32130, the search of the command string, if a match is found. It is also done when reversing graphics characters if a compressed frame would expand more than there is room for.

Modifying And Extending The Program

I grew tired of waiting for a frame to be stored and found that frames with quotation marks in them wouldn't be loaded properly, so I wrote the two assembly language subroutines shown in Listing 3. The first subroutine stores a subframe after space has been reserved for it. The second scans a string for a quotation mark. If a quotation mark is found, the subroutine returns a 0; if none is found, a nonzero number is returned. The machine language string scan subroutine is much faster than scanning a string in Basic, using a loop and the MID$ function to check every character.

To put the two machine language subroutines in memory you can either use an assembler to make a system format tape and then load it, or, if you prefer Basic, you can use the Basic program in Listing 4 to put the two machine language subroutines in high memory. The program in Listing 4 sets the memory size for you and lets you put the machine language program in memory starting at any high address. It checks each byte of the machine language program to make sure it was POKEd properly. If you have a bad memory location or you ask for the machine language program to be put in nonexistent memory, you are told that a datum (part of the machine language program) wasn't properly stored.

Partial sample run of Graphics Manager.

```
                GRAPHICS MANAGER BY JOHN CREW 2/2/82
████████████████████████████████████████████████████████████████
A - PRINT ASCII CODES
C - COMPRESS FRAME(S)
D - DUPLICATE A FRAME
E - ERASE FRAME(S)
G - REVERSE GRAPHICS
L - LOAD FRAME(S) FROM TAPE
P - PRINT FRAME(S)
Q - QUIT
R - RETURN TO MAIN PROGRAM
S - SAVE FRAME(S) ON TAPE
T - TRADE (SWAP) TWO FRAMES
U - UNITE (COMBINE) TWO FRAMES
███████████████ 6552 FREE BYTES OF FRAME STORAGE ███████████████
COMMAND? L
----------------------------------------------------------------

LOAD FRAME(S) FROM TAPE (Y/N)? Y
HOW MANY FRAMES DO YOU WANT LOADED? 0
 FRAME # 0 IS THE LAST
 NUMBER IS TOO SMALL
 ONLY ROOM FOR 6 MORE FRAME(S)

HOW MANY FRAMES DO YOU WANT LOADED? 2

INSERT TAPE AND PRESS PLAY BUTTON
PRESS ANY BUT A CONTROL
KEY TO CONTINUE?

FRAME # 1 LOADED
FRAME # 2 LOADED

                          DONE
----------------------------------------------------------------

                GRAPHICS MANAGER BY JOHN CREW 2/2/82
████████████████████████████████████████████████████████████████
A - PRINT ASCII CODES
C - COMPRESS FRAME(S)
D - DUPLICATE A FRAME
E - ERASE FRAME(S)
G - REVERSE GRAPHICS
L - LOAD FRAME(S) FROM TAPE
P - PRINT FRAME(S)
Q - QUIT
R - RETURN TO MAIN PROGRAM
S - SAVE FRAME(S) ON TAPE
T - TRADE (SWAP) TWO FRAMES
U - UNITE (COMBINE) TWO FRAMES
███████████████ 4504 FREE BYTES OF FRAME STORAGE ███████████████
COMMAND? P
----------------------------------------------------------------

PRINT FRAME(S)

STARTING WITH FRAME # (1 - 2)? 2
ENDING WITH FRAME # (1- 2)? 1
 YOU WANT REVERSE ORDER (Y/N)? Y

COPY ON MX-80 (Y/N)? N

NOW AND AFTER EACH FRAME IS PRINTED, PRESS ANY BUT A CONTROL
KEY TO CONTINUE?
```

To make Graphics Manager work with the two machine language programs, lines 32240, 32260, and 32630 should be changed to match Listing 5. Delete 32640 and 32664. If you use the Basic program to put the machine language into memory, you can remove CLEAR6553: from line 0. The program in Listing 4 ends with CLOAD so Graphics Manager will be automatically loaded, so I suggest you record the modified version of Graphics Manager right after it.

The program or program segments which appear in Listings 3 through 5 are written for a system with 16K of free memory. If you know Basic well and know a little assembly language, you could easily modify them for a different amount of free memory.

Extensions and Modifications

Some features you might want to incorporate into Graphics Manager are disk storage and retrieval of frames, and storage of more than nine frames at once (you would need to change the subframe number entry subroutines). You might also CLEAR more string space (If you have more than 16K of free RAM, I recommend CLEAR 1024*N+409 with N equal to the number of frames you want to be able to store at once); give each frame a name and search for a frame by name on tape, disk, and in memory; rewrite some of Graphics Manager in assembly language; allow storage and manipulation of partial frames; allow switching of frames from single to double width characters and vice versa; or write an assembly language program to load a frame containing a quotation mark.

Some more exotic features you might want to add are: top-bottom reflection of a frame; right-left reflection of a frame; shifting a frame right, left, up, or down; and rotating graphics about a user specified center. You might want to modify Sketch/Print and/or Vector Plotter so they could use double width characters.

Closing Notes

I hope you have found a useful program or learned something from this series. I worked extremely hard preparing it—experimenting, writing, and rewriting and I ask you to have the decency not to distribute my programs for your own profit. ☐

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Ralph The Mind Reading Computer

W. Don Bunn

When my wife volunteered to run a booth at a PTA carnival at my daughter's school she wanted to do something different. So, when I got home, she asked me if I might come up with something using our new Apple computer. I was on the spot because of the many times I had spoken in glowing terms of the many uses of a home computer. The result of my dilemma was the following program.

You pick a number between 1 and 10, the program tells you to manipulate the number in various ways and then gives you the number you end up with.

The algorithm is given in Table 1. The listing is given in Listing 1.

The program is divided into two parts. The first half of the program does the "mind reading." The second half checks your math if you and the computer don't agree.

Ralph was a great success at the PTA carnival. In fact he was such a great hit that we had to have three children playing at a time to cut down the length of the line for those waiting to play.

The most often heard comment was "How did it do that?" There were several repeaters, which was amazing when you consider the kids were choosing to do math problems over games which gave prizes. ☐

W. Don Bunn, 25308 E. 68th St., Broken Arrow, OK 74012.

Table 1.

Action	**Result**
Pick a number between 1 and 10	X
Double it	2X
Add an even number supplied by the computer	2X + 2Y
Divide by 2	X + Y
Subtract the original number	Y
Add a random number supplied by the computer	Y + Z
Computer output	ANS = Y + Z

Listing 1.

```
10  REM  MIND READER PROGRAMMED BY
      DON BUNN
20  REM   1 / 14/ 81 BROKEN ARROW
     , OK
30  INPUT "ARE YOU READY TO HAVE
     ME READ YOUR MIND ";J$
40  IF J$ = "Y" GOTO 60
50  GOTO 30
60  SPEED= 25
70  HOME
90  PRINT "MY NAME IS THE 'GREAT
     RALPH' THE WORLDS GREATEST M
     IND READING COMPUTER"
100  PRINT : GOSUB 660
110  PRINT "YOU WILL NEED TO DO S
     OME MATH SO          PENCIL AN
     D PAPER WILL BE PROVIDED IF
        YOU NEED THEM. NO CALCULA
     TORS PLEASE!
120  GOSUB 660
130 X =  INT (5 *  RND (1)) + 1:Y
      = X + X
140 Z =  INT (10 *  RND (1)) + 1:
     ANS = X + Z
160  HOME
190  PRINT "THINK OF A NUMBER BET
     WEEN 1 AND 10"
200  PRINT : GOSUB 660
210  PRINT "ADD THE NUMBER TO ITS
     ELF"
220  PRINT : GOSUB 660
230  PRINT "ADD ";Y
240  PRINT : GOSUB 660
250  PRINT "DIVIDE BY 2 "
260  PRINT : GOSUB 660
270  PRINT "SUBTRACT THE NUMBER Y
     OU FIRST THOUGHT   OF FROM T
     HE NUMBER YOU HAVE NOW"
280  PRINT : GOSUB 660
290  PRINT "ADD THE NUMBER ";Z
300  PRINT : GOSUB 660
310  PRINT "THE NUMBER YOU HAVE N
     OW IS ";ANS
320  GOSUB 660
330  INPUT "IS THIS THE RIGHT ANS
     WER? (Y/N) ";D$
340  PRINT
350  GOSUB 680
360  IF YES = 0 GOTO 430
370  FOR W = 1 TO 12: PRINT  CHR$
     (13): NEXT W
380  PRINT "THE 'GREAT RALPH' IS
     NEVER WRONG!"
390  PRINT : FOR W = 1 TO 10: PRINT
      CHR$ (7): NEXT W
400  GOSUB 660
410  GOTO 30
420  GOSUB 660
430  PRINT "BECAUSE THE 'GREAT RA
     LPH' ALMOST NEVER  MAKES A M
     ASTAKE OOPS!
440  POKE 37,21: PRINT
450  PRINT "MAKES A MISTAKE LETS
     CHECK YOUR MATH.
460  GOSUB 660
470  INPUT "WHAT NUMBER DID YOU T
     HINK OF ";T
480 R = T + T
490  GOSUB 660
500  PRINT "NOW ";T;" ADDED TO ";
     T;" EQUALS ";R
510 S = R + Y
520  GOSUB 660
530  PRINT "I ASK YOU TO ADD ";Y;
     " AND ";R;" + ";Y;" = ";S
540 U = S / 2
550  GOSUB 660
560  PRINT "I ASK YOU TO DIVIDE B
     Y 2 AND "
570  PRINT S;" DIVIDED BY 2 EQUAL
     S ";U
580 V = U - T
590  GOSUB 660
600  PRINT "I ASK YOU TO SUBTRACT
      THE NUMBER YOU    FIRST THO
     UGHT OF WHICH WAS ";T;" AND"
610  PRINT U;" - ";T;" = ";V
620 Q = V + Z
630  GOSUB 660
640  PRINT "I ASK YOU TO ADD ";Z;
     " AND ";V;" + ";Z;" = ";Q
645  GOSUB 660: GOSUB 660
650  GOTO 370
660  FOR I = 1 TO 2000: NEXT I: PRINT
      CHR$ (7)
670  RETURN
680  IF D$ = "Y" THEN YES = 1: RETURN
690  IF D$ = "N" THEN YES = 0: RETURN
700  INVERSE : PRINT "PRESS 'Y' O
     R 'N'...": NORMAL : GOTO 330
```

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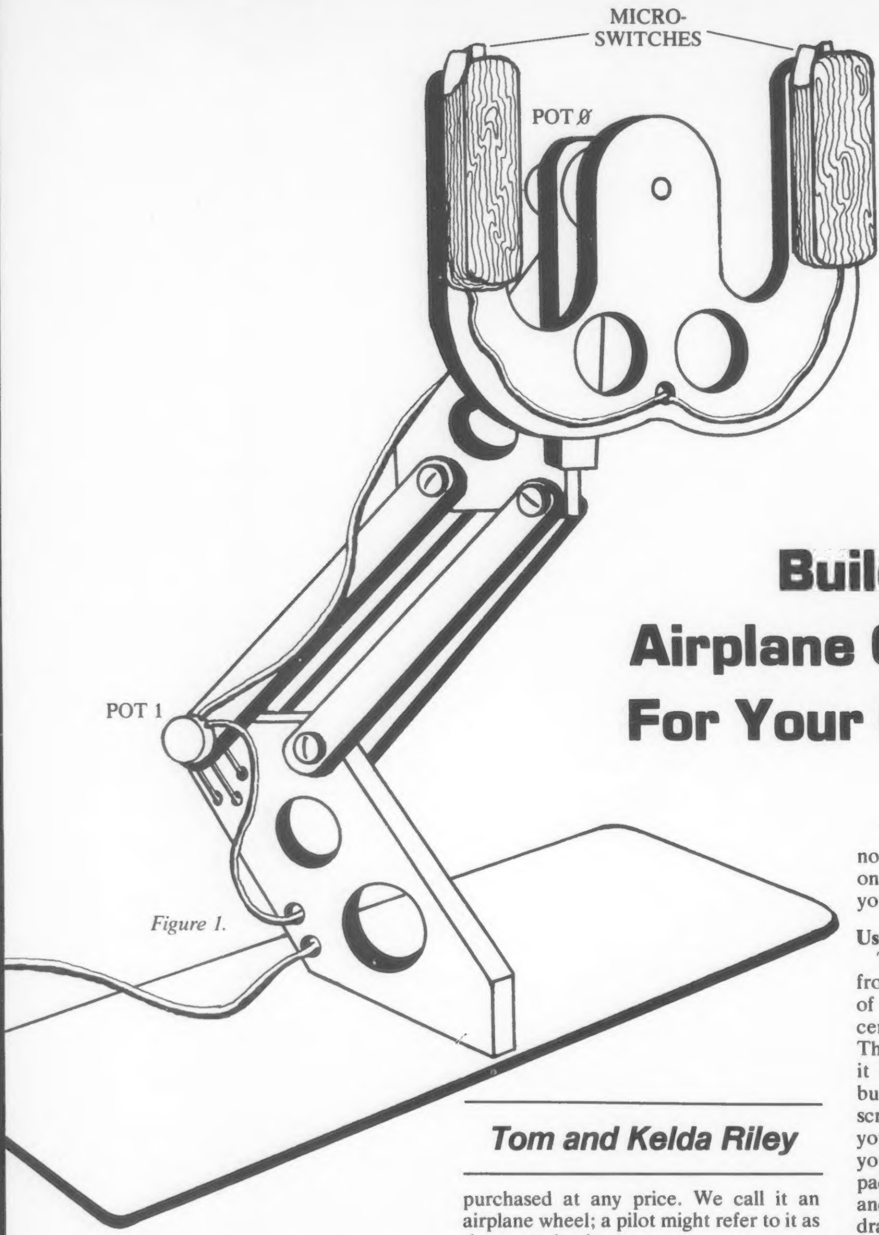

Figure 1.

Build An Airplane Controller For Your Computer

Tom and Kelda Riley

The first article in this series on home built controls for the personal computer detailed the rebuilding of existing paddles and joysticks to improve their electrical performance, beef them up mechanically, and give them a better feel (*Creative Computing*, February 1983, pp. 140-150). This month we will tell you how to build a new type of control, one which can't be purchased at any price. We call it an airplane wheel; a pilot might refer to it as the control yoke.

The control has two pushbuttons and provides two analog inputs. The first is the degree of turn of the wheel, and the second is the position of the wheel forward and back. These actions insure that the airplane wheel control closely imitates the actual controls of a small aircraft.

There are several airplane flight simulator programs and related games on the market, but they depend on input from the computer keyboard or from standard game paddles or joysticks. Unfortunately, no one flies an airplane by punching keys on a typewriter, and that isn't the way you *learn* to fly either.

Using the Control

To use this control you sit in a chair in front of your computer with the leg board of the control under your legs and the central wheel support between them. Thus seated, you can turn the wheel, push it forward and back, press the pushbuttons, reach the keyboard, and see the screen—all without changing position. All you have to do is plug in the control, run your flight simulator program using the paddle rather than the keyboard mode, and take off. The wiring shown in the drawings is consistent with the A2-FS1 Flight Simulator program from Sublogic.

The Drawings

Before you get excited and start building this device, let's look briefly at the drawings. Figure 1 is a sketch of the completed prototype indicating the leg board, lower support and struts, the wheel itself, and the hardwood grips. Note that two microswitches are mounted in the grips, potentiometer 0 is mounted in the wheel axis, and potentiometer 1 is mounted on the lower back strut.

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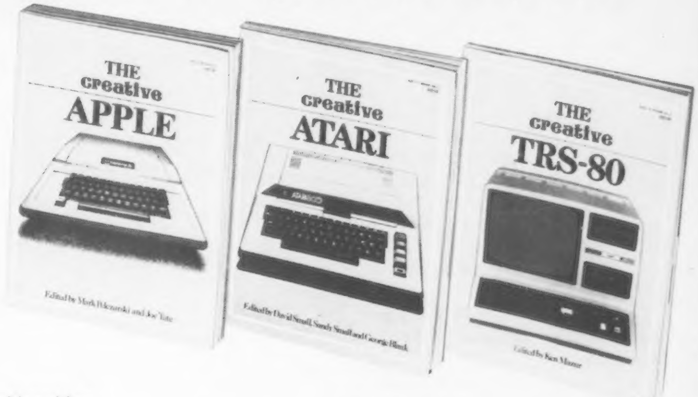

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Figure 2 is a side view that gives much more detail on assembly of the unit. Figures 3 and 4 show details of the component parts. Figure 5 is the electrical schematic, which will be explained in a separate section.

Construction Materials

The airplane wheel is constructed primarily of plywood and sheet metal. It can be built entirely with hand tools, but the use of a table or radial arm saw and a power drill will greatly speed up the work. It is therefore helpful if you have access to a home workshop or a local high school woodshop.

The best material to use in constructing the control is 1/2" hardwood plywood. We made the prototype out of the maple plywood door of a discarded kitchen cabinet. Regular fir plywood can be used, but the unit will not finish as nicely. Plexiglass scrap, 3/8" or 1/2" thick, would make a striking unit; plexiglass can be worked with wood tools if you proceed carefully. Many plastic suppliers will sell scrap by the pound at reasonable prices. Solid hardwood would also produce a good-looking unit, but it would be necessary to use a power plane to cut the hardwood down to the 1/2" thickness required.

The small parts needed to build the control include plastic washers cut from coffee can lids and bushings cut from 1/4" (internal diameter) brass tubing. The latter can be purchased at a local hobby shop. A scrap of sheet metal, plexiglass, or Formica will be necessary for mounting pot 0. The required nuts, bolts, flat washers, and wood screws are given in the Parts List.

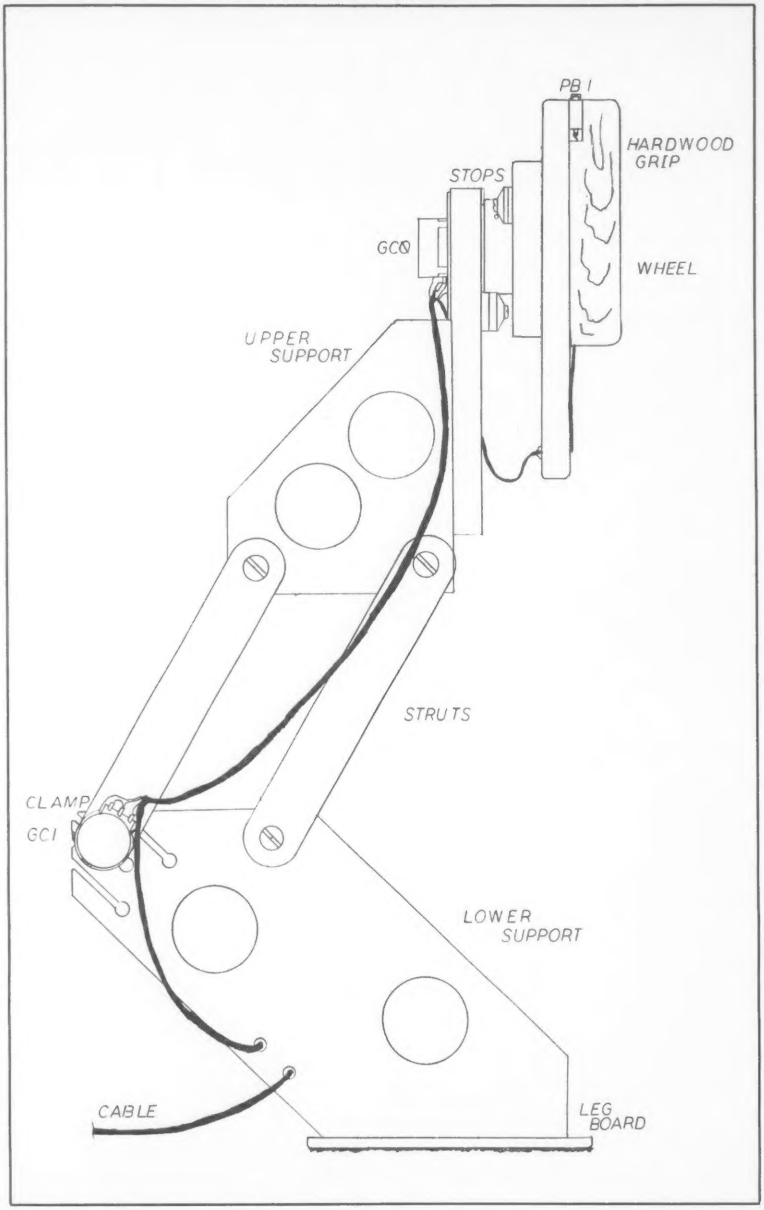

Figure 2. Side view of airplane wheel.

Construction Steps

Assemble all the materials and parts you will need for the project. Then start work by cutting out all the wood, metal, and plastic parts. The large holes in the upper and lower supports are included simply for decoration, to give the control a lighter, less massive look. They were cut out with a hole saw in a power drill, but may be omitted if this tool isn't readily available.

The physical size of pots from different manufacturers varies somewhat, so if you begin the woodwork before you have the pots, just drill 3/16" pilot holes for both the mounting hole and the shaft. When you obtain the pots you can drill out the holes for an exact fit.

Potentiometers are designed to be mounted through thin metal. To mount them on wood that is too thick for the pot bushing, first mount the pot on a 1/16" to 1/4" piece of stiff material (aluminum or steel sheet metal, plexiglass, or Formica) and then screw this piece securely to the wood. This is the method used for mounting pot 0 (see Figure 4). Pot 1 is shown mounted directly in the wood, but it could also be mounted in the manner just described.

When drilling sheet metal, never hold the work with your hand; the metal will spin and cut your fingers. Hold the sheet metal with visegrip pliers or in a bench vise. Start the holes in any of these materials with a pilot hole of about 1/8" in order to locate exactly the center of the hole, and back up the drilled piece with scrap wood to prevent breakout damage.

Observe that the wheel is attached to pot 0 by set screws tapped into the wood. Drilling and tapping is usually done in metal, not wood, but I have found that hardwoods like oak and maple work satisfactorily if the tap has course threads like the #10-24 shown in Figure 3. No lubricant is required for tapping in wood. Two Allen set screws at least 1/2" long are required. The screws should be drilled at right angles to each other. The tapping is most easily accomplished before the steering wheel parts are assembled.

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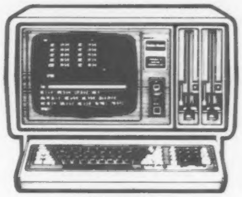

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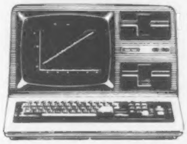

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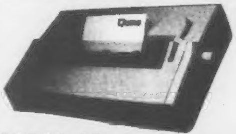

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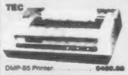

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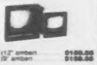

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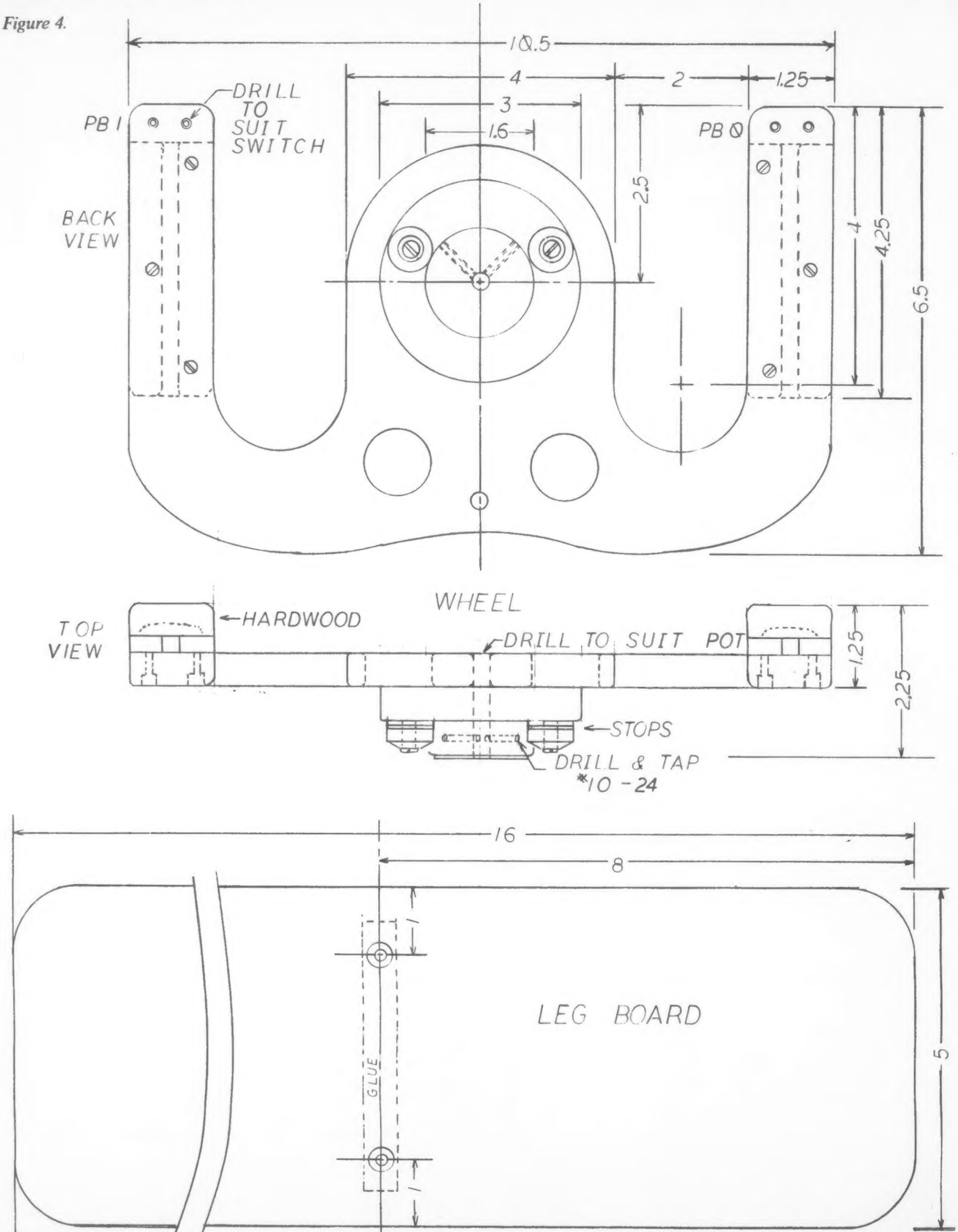
Figure 4.


10.5
4
2
1.25
3
1.6
2.5
4
4.25
6.5
PB 1
DRILL TO SUIT SWITCH
PB 0
BACK VIEW
WHEEL
TOP VIEW
HARDWOOD
DRILL TO SUIT POT
1.25
2.25
STOPS
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16
8
1
1
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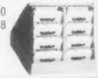

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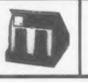

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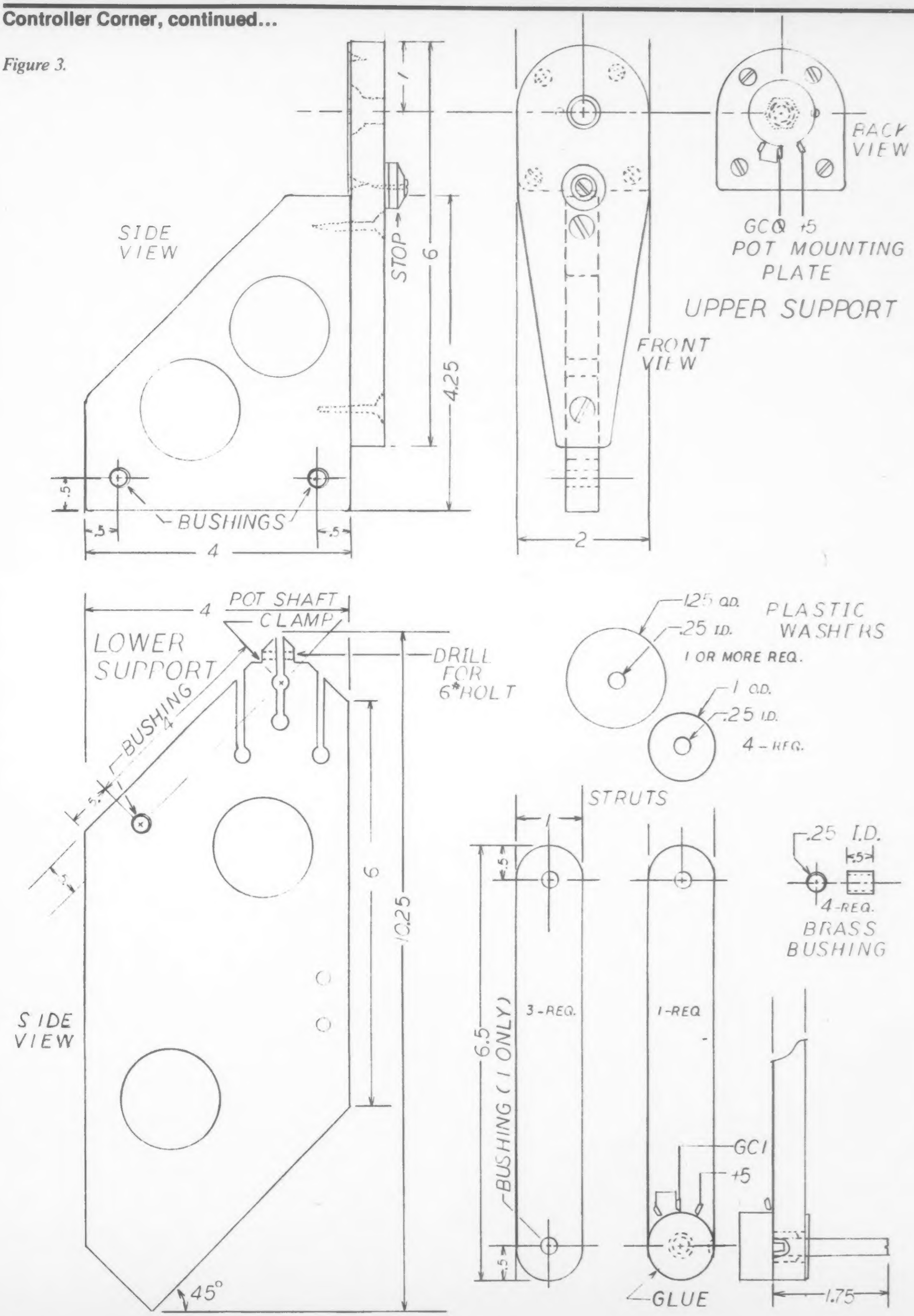
Figure 3.


SIDE VIEW
1
STOP
6
4.25
.5
BUSHINGS
.5
.5
4
FRONT VIEW
2
BACK VIEW
GC0 +5
POT MOUNTING PLATE
UPPER SUPPORT
4
POT SHAFT CLAMP
LOWER SUPPORT
DRILL FOR 6* BOLT
BUSHING
4
.5
.5
6
10.25
SIDE VIEW
45°
1.25 O.D.
.25 I.D.
PLASTIC WASHERS
1 OR MORE REQ.
1 O.D.
.25 I.D.
4-REQ.
STRUTS
1
.5
6.5
BUSHING (1 ONLY)
3-REQ.
1-REQ
.5
GC1
+5
GLUE
1.75
.25 I.D.
.5
4-REQ.
BRASS BUSHING

Inside the potentiometer is a small metal tab that stops the pot from turning a complete 360 degrees. (Most pots turn through 300 degrees.) This tab is not very strong, so stronger stops must be built to keep it from being accidentally broken in vigorous play. Figures 2, 3, and 4 show one stop screwed onto the top support and two screwed onto the wheel. These stops can be made from faucet washers or small rubber feet attached with roundhead screws. You may have to include flat washers under them if they don't touch each other. These stops will be precisely located during final assembly.

Both of the pots have 2" shafts. These long-shaft pots are sometimes difficult to obtain. If you can't find them locally, you can order them by mail. The ones for the prototype were ordered from Newark Electronics (see Parts List for the address). The minimum order is $25, so you may wish to go in with some other people on an order. Delivery time is four to six weeks.

Two microswitches are mounted in the wooden grips for use as pushbuttons. They are shown in Figure 2 mounted at the top of the grips; here, they are pressed with the thumbs. If you prefer, they could be pointed away from the user or to the inside of the wheel and pressed with the index finger. The switches and the #2 mounting bolts, which are extremely small, were purchased at Radio Shack, but suitable switches can be purchased from many mail-order houses. The Radio Shack switches (Cat. No. 275-016) have a small metal lever that is attached to the switch with a rather weak hinge. Reinforcing this hinge with a matchhead-size dab of silicone sealer helps to strengthen it.

The microswitches are mounted on the plywood wheel and covered by the hardwood grips which also have a hidden groove for the switch wires. The grips on the prototype were cut from scrap walnut, so they are particularly attractive.

The plastic washers are inserted wherever two wood parts would otherwise rub against each other. They are cut with scissors from polyethylene coffee can lids; the central holes were cut with a hand paper punch. These washers provide smooth turning while relieving the strain on the pot shafts.

The three bushings on the supports are installed where wood moves against the bolt threads. These bushings were cut from model shop tubing with a small triangular file. There is also a bushing in the one strut which goes over the shaft of pot 1. Fat metal washers are also used wherever bolt heads and nuts come in contact with the wood.

The lower support has built into it a clamp for the shaft of pot 1. The pot itself is mounted on the end of one strut and moves with that strut. The pot was fitted to the strut and held with silicone sealer. In constructing the clamp, a pattern of holes is cut into the support to let the clamp close down on the shaft when the #6 nut and bolt and flat washer are tightened. We strengthened the wood near the clamp by coating it with epoxy, and later redrilled the holes.

Sub-Assembly of Wood Parts

After you have cut out all wood parts and given them a preliminary sanding, you can begin assembling them. The lower support is attached to the leg board with two #8 x 1" flathead wood screws and wood glue. Counter-sink the screws flush with the wood surface. Assemble the top wheel support in the same way. I prefer to use Elmer's Carpenter's Wood Glue, but any good quality wood glue will suffice. Keep a damp cloth handy to wipe off excess glue.

Next, assemble the wheel hub with wood glue by putting a 1/4" bolt with flat washers through the central hole in each piece. Tighten the bolt to clamp the three pieces together. The hand grips have to be custom-fitted to the wheel and holes for #4 screws drilled through the plywood wheel, but the grips are not glued on. Drill mounting holes through the plywood, not the grips, for the microswitches.

Finishing

If you have done a good job on the woodwork, then it is worth doing the same high quality work on the finish. Prepare the wood by rounding all corners with a fine rasp, and sand all surfaces. An orbital sander is best for this job: start with #80 sandpaper, then do a light sanding with #120 paper to finish up. The plywood parts can be stained if you want a dark finish, or they can be painted with an oil-base enamel in a color you like.

Now you are ready to apply a stain-finish polyurethane varnish, using two or three coats over a stain or one coat over enamel. The polyurethane will give the enamel a rich look and keep the enamel from leaving marks on the furniture or the floor.

Final Assembly

Pot 0 should now be installed through its mounting plate. Be sure to make a small hole for its spin prevention tab. Screw the mounting plate to the top wheel support. The four brass bushings are installed in the following locations: two in the top support, one in the front hole of the bottom support, and one in a back strut. If the bushings fit tightly you will not need to glue them. The #1 pot is glued on one of the struts. The hole in the strut should be drilled out to a snug fit on the pot bushing (not on the smaller shaft). Then cut a notch for the tab and glue the pot with epoxy or silicone sealer to the strut.

Now attach the struts to the two supports, using for each pair two flat washers, two plastic washers, and a nut. When you are certain you have the unit assembled correctly, lock on the nut with Loctite thread sealant, super glue, or fingernail polish. The bolts should be tight, but the struts must move freely when moderate force is applied. You can also install the clamp bolt in the lower support at this time, but do not clamp the pot shaft until the final adjustments are made.

You may wish to lubricate the bushings and flat washers with a tiny amount of

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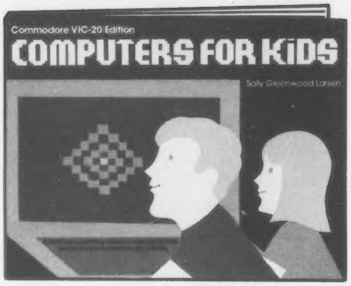

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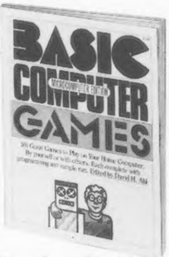

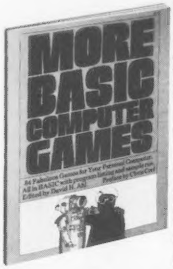

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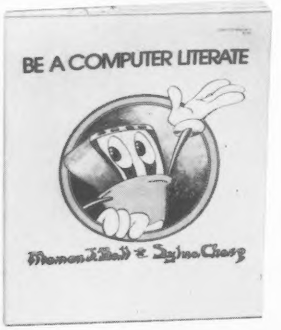

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petroleum jelly or candle wax. I think the wax gives a better feel to the movement of the finished device.

Now press the wheel on the pot shaft. You may have to chase the hole with a drill bit to clear out excess glue and finish. The big plastic washer goes between the wheel and the support. If the pot shaft sticks out of the front of the wheel, you can either cut off the shaft or install additional large washers. The wheel stop on the top support can be installed at this point, but the two stops on the wheel itself must be left off until final adjustments are made.

Electrical Components

Electrically, this unit is just an overgrown joystick with two pots and two pushbuttons. The wiring schematic, Figure 5, is for the Apple II, but you can build an airplane wheel for any computer that can handle a two-pot joystick and at least one pushbutton. To do it, you must use the correct pot values, find the right plug, and make changes (mostly pin numbers) in the electrical wiring. Your task is simply to search out this information concerning a standard joystick for your system and copy the electrical connections.

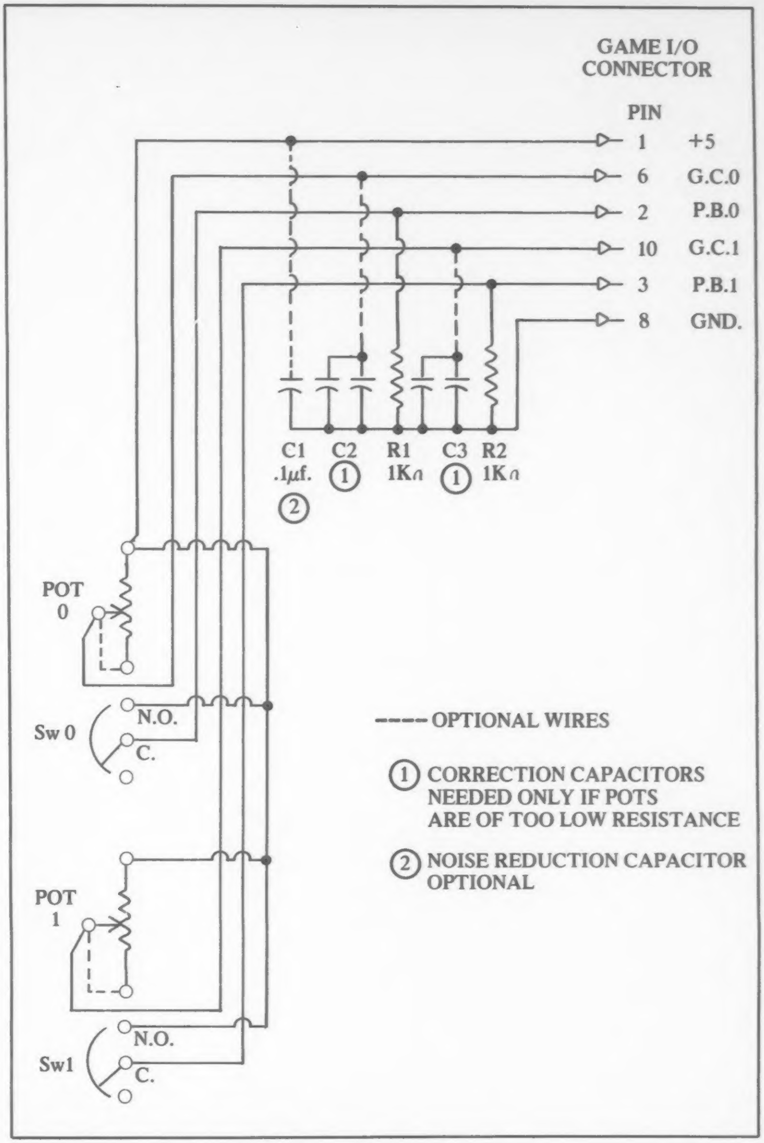

Figure 5. Game Paddle with Correction Capacitors.

In the prototype, the pot 0 value is 150K ohms, an unusual value but standard for Apple paddles. The 0 pot should be long-shafted, completely enclosed, and of good mechanical construction. The Parts List gives a suggested manufacturer's part number and supplier. If the pot does not have a screwdriver slot across the end of the shaft, you will have to cut one with a hacksaw, since the shaft must be turned with respect to the wheel for final adjustment.

Pot 1 is a bit different. This pot does not turn through its full range. (As noted earlier, a normal pot will turn through 300 degrees from one stop to the other.) The struts that move pot 1 will permit only about 170 degrees of turn. If we desire a full reading we must use a larger pot, one that will go from 0 ohms to 150K ohms over a turn of 170 degrees. We also have to choose a value for the pot that will let us purchase the actual item.

For the Apple II, a value of 250K ohms works very well. Other computers will require a value about one and one-half times that of the standard pot. For an Atari which uses 1 meg-ohm pots, you will need a 1.5 meg-ohm pot which must also be long-shafted and mechanically sound.

The pushbuttons in the prototype are microswitches that have a metal lever on top. We purchased them at Radio Shack. There are three terminals on the bottom of each switch, labeled C, N.O., and N.C. We used the one marked C (common) and the one marked N.O. (normally open). You may use any type of normally open, momentary contact switch that will fit neatly on the wheel.

The plug for the Apple II is a 16-pin DIP header, sometimes called a component carrier. When you solder this device, be sure to plug it into an unattached 16-pin socket so that the heat doesn't loosen and misalign the pins. The #1 pin of the plug is marked by a cut-off corner; the wires normally trail out the end near pin #8.

Figure 5 shows two 1K ohm pull-down resistors from the pushbutton pins #2 and #3 to ground. If you are very careful, you can mount these resistors inside the header itself.

The schematic also shows correction caps, which are only necessary if the pots you are using have too low a resistance value. Their use was explained in the first article. If you use correction caps, they can be mounted on a small piece of printed circuit board about one foot up the cable. The electrical noise prevention cap shown in Figure 5 is optional, but could be mounted beside the correction caps.

To determine the number of conductors required for the cable, count the +5 supply, the two pot wires, and the two pushbutton wires; you will need five conductors. If you weren't able to find exactly the pot size you need and are using the correction caps, you will also need a ground wire.

I don't particularly like working with the flat ribbon cables that are used in many commercial joysticks; I have repaired too many broken wires in them. Radio Shack sells a good four-wire telephone cable (Cat. No. 278-366) that works well in constructing controls if you are careful not to overheat it while soldering. If you have the correct pot values and choose to use only one pushbutton, you could get by with only four wires and run a single cable. If you need more than four wires, you should use two runs of cable and double up the +5 wire.

Soldering Procedures

To do the soldering in this project you need a small soldering iron (about 25 watts), resin core solder, wire strippers, and a small pair of long nose pliers. Figures 2 and 4 show which terminals of the pots to use for the various wires and where to route the cable. Start wiring at the pushbuttons and work back to the plug. You will need a three-conductor loop of cable to extend from the wheel to the back of the top support. It must be long enough to allow 300-degree rotation of the wheel. You can work out the correct length and location of the anchors by trial and error.

Before you wire the unit, make two photocopies of Figure 5. Then, as you run each wire and make each solder joint, trace it in on one of the copies, using a colored pencil. After you have finished the wiring, it is a good idea to have another person go over the unit, checking out the wires with a colored pencil on the second photocopy of the schematic to make certain that you haven't omitted any connections.

If you have a multimeter you should also check the resistance from pin #1 (+5 supply) to pin #8 (ground). You should always get a reading of at least 50 ohms on any control, and the reading ought to be much greater. Watch this reading while pushing the buttons and turning the pots. It must always be high.

Alignment

Aligning the control requires a simple program that repeatedly shows the reading of pots 0 and 1 and the condition, open or closed, of pushbuttons 0 and 1. The article in the February issue gives just such a program, but you can quickly write your own. Be sure to put a slight delay between the two paddle readings. Check out the program on a standard joystick or paddle before testing your new creation.

Now turn off the computer and plug in the new unit, making certain that the #1 pin in the plug is in the correct hole. Turn on the computer. If it doesn't start up *exactly as usual*, turn off at once and recheck your work. Now load your check program and place your airplane wheel in position under your legs.

We will start the adjustments with pot 0. Turn the airplane wheel slowly and check that the pot reading goes from 0 to 255. Now center the wheel and, using a standard screw driver, turn the pot shaft inside the wheel until the reading is 127 with the wheel centered. Press the wheel firmly on the shaft and tighten the set screws.

To locate the two stops on the wheel (the single stop is already mounted on the top support), turn the wheel until you feel one of the stops inside the pot. Now back

Number Required	Description of Part	Suggested Supplier	Cost
1	JA1N200P154UA pot, .15 meg., 2" shaft	Newark	$4.00
1	JA1N200P254UA pot, .25 meg., 2" shaft (pots manufactured by Allen-Bradley)	Newark	4.00
2	#275-016 subminiature lever switch	R.S.	2.80
4	#2 x 5/8" bolt and nut	R.S.	2.00
20 feet	#278-366 telephone cable, 4-conductor	R.S.	2.40
1	Header, 16-pin dip	Jameco	.70
1	16-pin dip socket (temporary solder jig)	Jameco	.70
2	Resistors, 1K ohm, 1/4 watt 5%	R.S.	.20
2 feet	Hardwood plywood-1/2"		4.00
1 foot	Masonite, 1/8" tempered		2.00
2 feet	Hardwood, 1 x 2	Scrap	
1	Bolt and nut, #6 x 3/4"		.20
3	Bolts, 1/4 x 20 x 2"		1.50
3	Nuts, 1/4 x 20		.30
8	Flat washers-1/4		.30
3	Rubber feet with screws		1.70
4	Flathead screws, #8 x 1"		.25
2	Set screws, #10-24 x 1/2"		.50
4	Flathead screws, #6 x 1/2"		.25
6	Flathead screws, #4 x 3/4"		.50
1	Brass tube, 1/4" I.D.	Hobby shop	.60
2	Coffee can lids, polethylene	Scrap	
1	Sheet metal plate, 2" x 2"	Scrap	
2 feet	Cotton felt		1.00
1 ounce	Silicone sealer		1.20
1 pint	Polyurethane varnish		2.00
1 pint	Stain or enamel for finishing		2.00
Misc.	Sandpaper, electrical tape, glue, etc.		.90
		Approximate Total	$36.00

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off this stop just a little and check that the reading on the screen hasn't changed. Hold the stop in place and mark its center with a sharp point, like an awl. Repeat the procedure on the other side for the third stop. You may have to remove the wheel to install the stops properly, then replace and center it again.

To adjust pot 1, pull the wheel as far as you can, leaving the clamping bolt loose. Adjust the pot with a standard screwdriver until the reading on the screen just reaches 0. The forward motion must be stopped by contact of the wood parts, not by the tab inside the pot. Now lock the clamp by tightening the clamp bolt. Pushing the wheel back should now bring the reading all the way up to 255, and a reading of 127 should be at a center position that is comfortable to hold. Press the pushbuttons to make sure they work.

Now load your favorite flight simulator program or space game and take off.

Finishing Touches

To give the unit a finished appearance and make it last longer, you may want to do the following:

- To keep the cable out of your way and prevent it from being pulled loose, you can tie it to the wood parts.
- Silicone sealer can be used to cover the exposed electrical connections and the back of the plug. This is called "potting."
- The ends of the wire loop between the top support and the wheel should be mechanically secured. You can tie one end to the pot with dental floss and silicone sealer. Likewise, secure the other end to the wheel with the same materials and a small screw.
- Gluing felt on one or both sides of the leg board with contact cement gives a nice finishing touch to the control.
- You can personalize the finished unit by placing a paper cutout or a hand-drawn emblem in the center of the wheel. This should be done after final pot adjustments are complete. The prototype is adorned with the tiger head (easily recognizable from an ad for a popular printer).

The drawings show the prototype exactly as built. You almost certainly will want to make some improvements of your own, particularly if you build more than one unit. As mentioned earlier, the clamp and mount for pot 1 could be strengthened with some sheet metal parts and set screws.

The wheel axis of the prototype is parallel to the leg board and floor. A pilot who tested the unit suggested angling this axis down a little in back to be more like the steering wheel of a light plane. This could be done by adjusting the angles of the lower support.

The unit shown in the drawings is about right for most average-size adults. You could extend the lower support as much as four inches if the paddle were to be used primarily by a taller individual, or shorten it by two inches for children.

Feedback

We would like to hear about your experiences in building the airplane wheel. Let us know about any difficulties you run into, any instructions that aren't clear in this article, or any parts you have trouble finding. Describe the software you use and how well it works with the airplane wheel. Please include a self-addressed, stamped envelope if you want a reply. Have a good flight.

Coming Up

In the next article we will look at building multiple sockets that will bring the controller plug out of the computer to a more convenient location beside it. These multiple sockets will also let you plug in more than one control at a time so you can choose the one you want with a switch, and even use two joysticks at once for playing two-person competitive games. ☐

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outpost: atari

Well you may or may not have heard the news, but the Atari 1200 has arrived. Here is a first look at the 1200 XL, and the new wave of peripherals designed to work with it.

John J. Anderson

New Member of the Family

The Atari 1200 XL was unveiled on the East Coast at a press conference at the Plaza Hotel in New York City. At least a dozen working units were on display there for us computer types to play with, and that's exactly what we did, at great length. The unit should become available within a few months.

With 64K RAM standard, the 1200 XL also offers 12 user programmable function keys, international character set, and built-in diagnostics. Since it is designed to be entirely compatible with the models 400 and 800, owners of the Atari 1200 XL need not wait for software to be developed to run on their machines. Although no true innovations are present in the 1200, Atari apparently thinks that competitive pricing will make it a major contender in the home computer market this year. Though a list price of $899 was announced, this will probably drop soon after the unit becomes available.

Other features of the Atari 1200 XL are the following: keyboard disable function; auto-screen shut-off when untended; help key; LED power, keyboard lock, and character set indicators; and one-touch cursor control.

The single ROM cartridge slot and two controller jacks have been moved to the side of the machine. The determination was made that the extra slot and controller jacks on the 800 were superfluous, and would add unnecessary expense to the new machine. The keyboard, in contrast, is of higher quality than its counterpart on the model 800.

New Peripherals, Too

Three new peripherals were announced along with the 1200 XL. The 1010 program recorder will allow inexpensive storage and retrieval of data using audio cassettes. The unit features data and audio channels, as did its predecessor, the model 410. It will list for $100.

The model 1025 80-column printer will list for $550. It is a customized Okidata Microline 80, and will run in serial at a claimed speed of 40 cps. The dot matrix print is clear and crisp, though definitely far from letter quality.

The Atari 1200 XL. Certainly in terms of looks, it's a 10.

The unique 40-column color printer and plotter, dubbed the model 1020, will offer text and graphics in four colors at a list price of $300. It will be capable of changing the size and style of its character sets, and 16 pen colors will be available.

The only disk drives I saw in my extensive snooping about were the old model 810 clunkers, which are compatible with the model 1200, but certainly look out of place next to it. I expect we will be seeing a new, slimline drive from Atari within the next half year—with improved storage in a more streamlined package.

Conclusions concerning the hardware? Well, I think it is a bit early to say yet. I'm going to withhold judgment on the machine for at least one issue, until I can actually procure one for investigation. The unit has already attracted criticism, with detractors pointing to the lack of innovation in its design. True enough, the substantial technological lead the 400 and 800 achieved in 1979 has now been largely lost. More than one manufacturer used these models as reference points in designing their own "next-generation" machines. A sincere form of flattery, to be sure, but also a growing threat.

Another lament comes disguised as a blessing: the fact that parallel port and RS-232 access will be phased out along with the 850 interface module. The Atari 1200 XL can drive a serial printer without resort to ancillary hardware, and this saves money as well as space. At the same time, interfacing will be restricted to serial communication on a non-standard bus, or connection through the joystick ports. That is not exactly my definition of hardware flexibility. Third-party hardware makers are especially wary of this design decision. Without any doubt, Atari marketing has evidenced interest in limiting hacker access to its brainchildren, to the extent of omitting standard interface capability. It gives one pause . . .

I have some more tidbits to share with you this month, but first I want to turn the soapbox over to a good friend from MACE in Michigan, Marshall Dubin. He will present a guest tutorial on the topic of PIA interfacing. With the information presented here, you can actually get your Atari to make the proverbial coffee in the morning.

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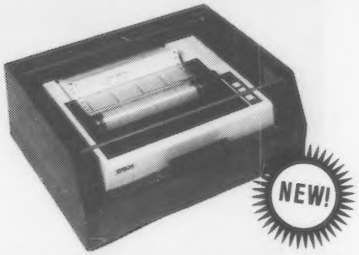

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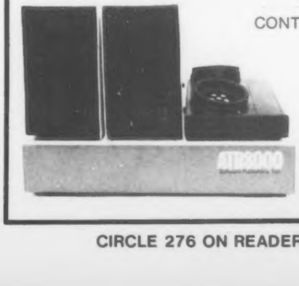

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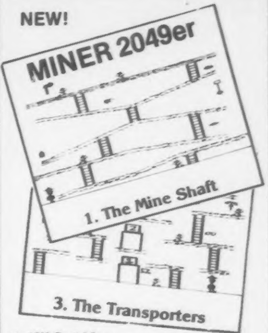

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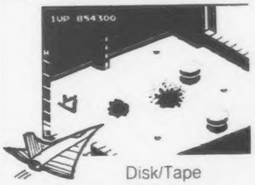

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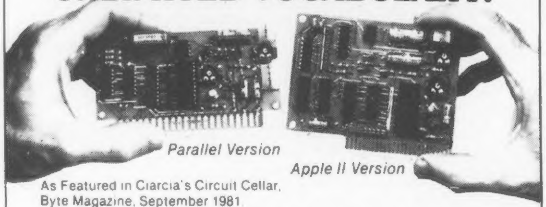

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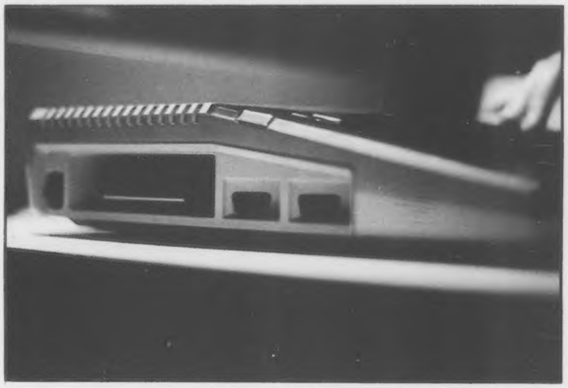
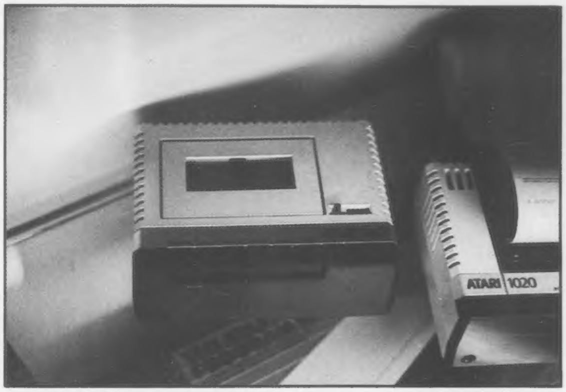


On the left-hand side of the machine is a single cartridge slot and two controller jacks.

The Atari 1025 80-column printer is the equivalent to the Okidata Microline 80.



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Interfacing Your Atari

Looking for some "off the beaten path" type of excitement? Tired of blasting aliens, running through mazes, and balancing your checkbook? Are you the adventuresome type? Well, this could be the project for you. With a few parts and a little time in the workshop, you can have your Atari lighting lights, dialing phones, reading and regulating thermostats, and generally communicating with the outside world.

Through the front controller ports of the Atari computer, there are available for your use 16 programmable input/output pins, eight analog-to-digital inputs, and four input only pins. These controller ports can be used with interface circuitry to monitor devices such as thermostats or light sensors, or to activate relays, motors, and lights.

We'll discuss various ways of using the front controller ports to communicate with the outside world. For the braver of you, we will be building an I/O interface, so that you may sense signals, and turn on small relays. This will plug into the front port of your computer and allow you to connect various real world devices. (Vic owners should note that the joystick ports on your machine are identical to the Atari ports. With the exception of any software drivers, the electrical connections should be the same.)

Please note that this kind of interfacing may void your warranty. If you are not sure, check with your dealer or factory representative. Also note that accidents *do* happen. It is possible (although unlikely if you are careful) to do some drastic damage to your computer. If you are not sure how to do something, *don't do it.* Also keep in mind that although the power required for digital work is usually between 5 and 12 volts, a relatively safe level, the primaries of these power supplies are usually 110 volts. Follow these few common sense rules:

1. Be careful. Always keep high voltage well away from your work area.
2. Be neat. Tangles of wires scattered around tend to cause short circuits.
3. *Never* do any wiring or soldering with the power to the computer turned on.
4. Use a low heat (25 watt) soldering iron. Do not use a soldering gun.

Now let's do some interfacing.

The Basics

As you can see from the pin diagram in Figure 1, each joystick port has several potential input sources available. For example, two of the pins are intended for use with the paddle controllers. These are called the *analog* pins. They take an analog source such as vari-

Outpost: Atari, continued...

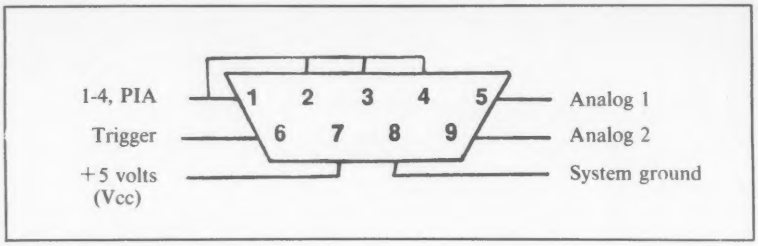


Figure 1. Front panel pin diagram.

able resistance and convert it into a digital signal.

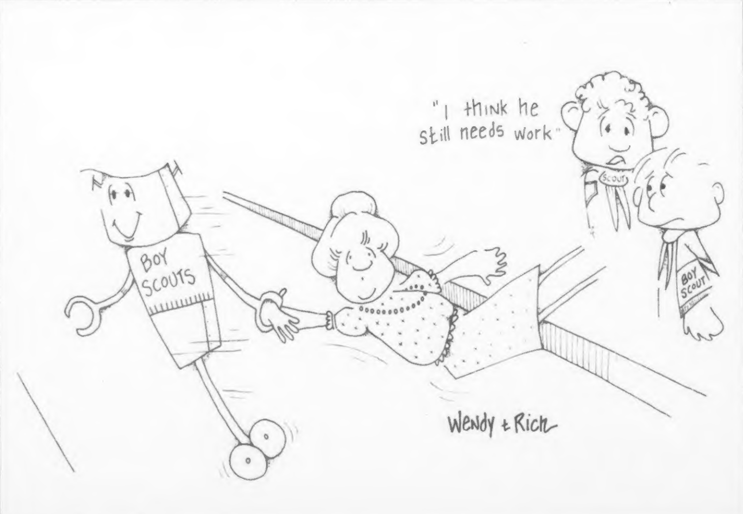
This is how the paddles function. They provide a resistance via a potentiometer within the paddle unit, between the analog input pins and +5 volts DC. The computer interprets the variable voltage as a digital number between 0 and 228. This is called "on board" analog-to-digital conversion. Units performing a similar function may be purchased at a hefty price, but Atari owners have the use of eight of these units built right in.

For now, let's concentrate on pins 1-4 on the joystick ports. These are the pins of the *Peripheral Interface Adapter* chip, more commonly referred to as the PIA. Basically the PIA provides a means of connecting your computer to peripherals. The PIA chip can be programmed for either input or output. There are two PIA ports of eight bits each available for your use.

Joystick ports 1 and 2 compose PIA port A, while joystick ports 3 and 4 compose PIA port B. Each port is one byte (eight bits), and they may be used together or individually to provide input and output functions. Some of these functions may be used to drive a printer or other accessory, or even a series of power relays which can control alarms, lights, appliances, motors or other devices.

The snag involved in controlling larger interface devices is basically a problem of taking a small amount of power and amplifying it. The ports on your computer are not made to power anything more than another chip. The manual recommends a *maximum* load of 1 TTL (about one chip) at 50 ma. To do anything really useful, we must be able to power at least 12 to 24 volts. This higher voltage can drive a wide variety of relays and interfaces.

There are several ways to accomplish this task. The most common arrangement is the transistor driver. In this arrangement the computer provides a very small voltage which turns on the transistors which in turn switch the load. A second way is through the use of opto-isolators. The computer provides 5 volts which switches the LED (light emitting diode) of the isolator on. When the diode is lit, a photo sensitive transistor, which is connected to a larger load or a relay, is triggered.



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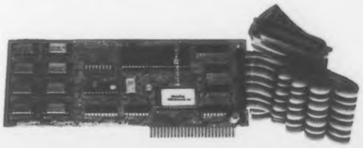

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TECHNOLOGY UPDATE

Outpost: Atari, continued...

A third way, and the one we shall use, is to employ an integrated circuit interface chip. The chip we will be using is the SN7407 made by Texas Instruments. The 7407 allows switching of up to 30 volts from the 5 volt TTL level of the Atari, with enough current to handle a small relay. Using this one chip, we can drive up to six relays from the Atari front ports.

The SN7407, as shown in Figure 2, is an open collector device. To use it properly you must connect a 2.2K ohm resistor from each output to +5 volts. This is called a "pull up" resistor. When an output of the 7407 is on it is actually open—so the resistor supplies power to the device you are driving. You can drive up to 30 volts at the outputs (but you may have to tamper with the value of the resistor somewhat).

When an output is off, it is shorted to ground, and your device sees 0 volts (ground actually). The resistor limits this current to a fairly low value so you don't blow the power supply or worse, the chip. Now this is the sequence of events:

Atari: HIGH (logic 1)
7407: OFF - Device is OFF.
Atari: LOW (logic 0)
7407: ON - Device is ON.

Since the resistor can't supply much current, the resistor/7407 combination is seen as the "ground side" of the circuit. That is, to drive a relay, we connect power to one side of the relay, and the other side to the output of the 7407. Then when we turn the relay on, current will flow through the relay, and then through the 7407 to ground.

You can easily drive LEDs (such as test lights) this way too, as well as a variety of small relays or solid state switches. Just make sure you *sink* the current—that is, one end of your driven device goes to +5 (through a resistor!) and the other end to the 7407. Sending a 0 (logic level low) to the PIA turns the device on, and a 1 (logic level high) turns it off. If you want to do it the other way around, use the inverting 7406 chip, which will turn your device on with a high logic level and off with a low level.

Recognize that the default state of the PIA when the computer is powered up is all bits high. If you are using an inverting 7406, your devices will come alive when you turn on the Atari. This is why I prefer to use the 7407, since I can power up and then have my software drive the devices by writing a 0 to the bit from which I want to power a device.

Speaking of bits, a few words are in order about the structure of the ports before you run off to warm up your soldering iron. The PIA as I mentioned earlier consists of two ports, port A and port B (or PORTA and PORTB for you mnemonic freaks). These are controlled through the use of the control registers for each port, PACTL and PBCTL. You may have heard of the PACTL because it is the one you POKE to turn on the cassette player. The addresses are as follows:

PORTA 54016/$D300 - Port A address
PORTB 54017/$D301 - Port B address
PACTL 54018/$D302 - Port A control
PBCLT 54019/$D303 - Port B control

When you turn the computer on, the ports are initialized to $FFFF or all bits high. To use a port for input, just pull the bit of your choice low by connecting it to ground. To use the port for output, it first must be formatted for output. The procedure is not complex:

1. POKE the control register (PACTL or PBCTL) with 56/$38 hex.
2. Now POKE the port (PORTA or

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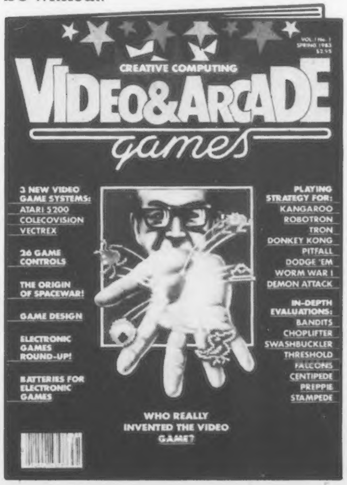
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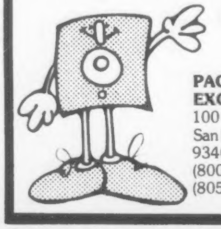

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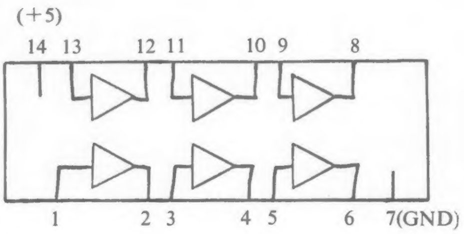
Outpost: Atari, continued...

PORTB) with 255/$FF hex. This specifies that the port will be used for output.

3. POKE PACTL or PBCTL with 60/$3C hex.

4. Now just POKE the port (PORTA or PORTB) with your data.

Essentially you have a total of 16 bits with which to play. Just remember that two joystick ports make up one PIA port. Sticks 0 an 1 are the A side and sticks 2 and 3 are side B. Each joystick port is four bits or one nybble. Each side of the PIA is eight bits or one byte. When programming for output, you must remember that a specific *bit* is driving a device. Therefore one joystick port


(+5)
14 13 12 11 10 9 8
1 2 3 4 5 6 7(GND)

Pin	Function
1	gate 1 in
2	gate 1 out
3	gate 2 in
4	gate 2 out
5	gate 3 in
6	gate 3 out
7	ground
8	gate 6 out
9	gate 6 in
10	gate 5 out
11	gate 5 in
12	gate 4 out
13	gate 4 in
14	+5 volts DC (VCC)

Figure 2. SN 7407 Diagram.

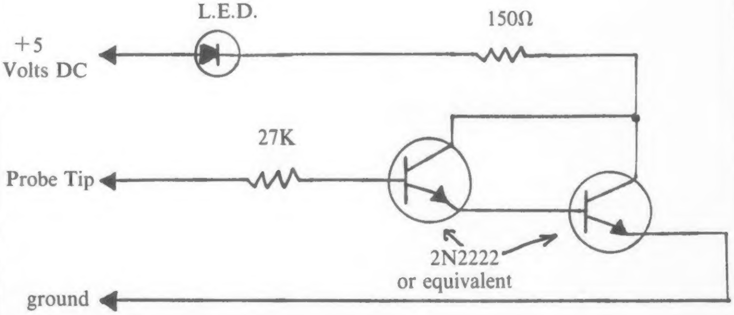
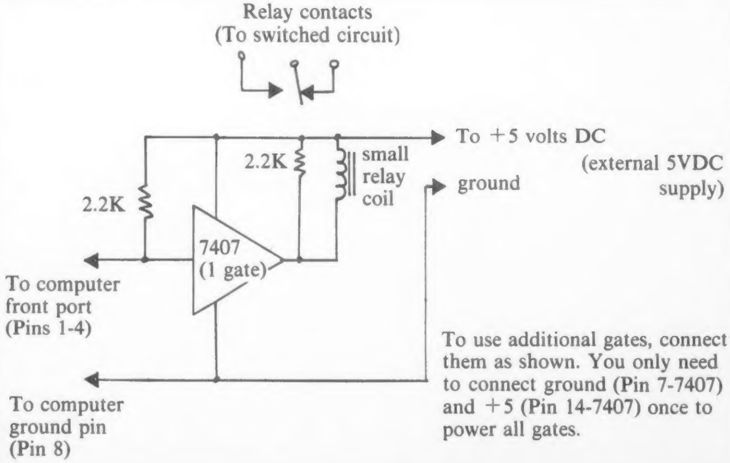

L.E.D.
150Ω
+5 Volts DC
27K
Probe Tip
2N2222 or equivalent
ground

Figure 3. Logic Probe Schematic.


Relay contacts (To switched circuit)
To +5 volts DC
(external 5VDC supply)
ground
2.2K
2.2K
small relay coil
7407 (1 gate)
To computer front port (Pins 1-4)
To computer ground pin (Pin 8)

To use additional gates, connect them as shown. You only need to connect ground (Pin 7-7407) and +5 (Pin 14-7407) once to power all gates.

Figure 4. 7407 interface (1 gate).

can drive four devices (one for each bit). An entire PIA side will handle eight devices, and if you use both A and B sides you can trigger 16 individual devices at once or in any combination.

You must POKE into that port a decimal number whose *binary* representation will switch on a certain bit or series of bits. For example, if I POKEd a 255 into port A, all bits would be on. If I POKEd a 12 into port A, bits 3 and 4 only would be on, since the binary of 12 is 1100. The individual joystick ports may be read using the shadow registers as follows:

Jack 1 (STICK 0) 632/$278 hex
Jack 2 (STICK 1) 633/$279 hex
Jack 3 (STICK 2) 634/$27A hex
Jack 4 (STICK 3) 635/$27B hex

Each port will return a number between 0 and 15. You also can use the Basic keyword STICK to access these ports, e.g., X=STICK (0).

The Hardware Part

Generally, all of the circuits we will describe can be breadboarded in any way convenient for you. For those of you just starting out, and who want to do some experimenting, I recommend the following workbench supplies:

- A solderless breadboard or wire wrapping setup for prototyping your circuitry. (These are made by Vector, Tandy, and others.)
- A variety of IC and transistor sockets.
- An anti-static mat or spray.

In addition, for this project, you will need at least one DE9S connector to match the front joystick port, and some multi-conductor wire.

Now let's get started by building another useful tool for you to use: a logic probe. Figure 3 shows the construction diagram of a two-transistor logic probe. You can "steal" the necessary 5 volts from the computer on board power supply. When the LED is on, this indicates a logic 1 or high condition. No LED indicates a 0 or low condition. (Actually that is not exactly true. This logic probe cannot detect the actual 0 state. There are more sophisticated probes able to differentiate high, low, and high impedance logic states, but what do you want for less than a buck?)

One way to mount the probe is to build the unit on a small (1" by 2") perfboard, and then slide the completed assembly into a large cigar tube. A small probe tip can then be soldered to the front of the cigar tube, and wires for the required 5 volts and ground can come out the back end and terminate in small alligator clips.

A Useful Interface Board

Figure 4 is a schematic diagram of an

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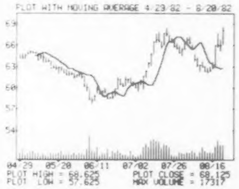

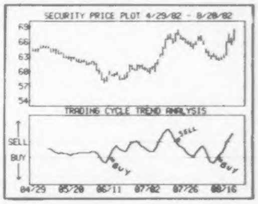

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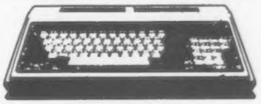

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output interface board which is connected to the front ports of the computer.

The heart of the circuit is the 7407 chip. As you can see, the input channels of the 7407 are connected to the front port by way of the 2.2K pull-up resistor. Even though the port initializes to FFFF (or all ones), it maintains a high state until we do otherwise.

The output of the 7407 provides the ground side of a relay circuit. The relay coil is connected to the 5 volt supply (*not* the one on the computer port). When the 7407 is activated by having one of the front port pins pulled low, it provides the relay coil with a path to ground, and the coil energizes. The relay controlled by the coil can be used to switch on just about anything, including other relays to drive larger loads.

During construction be careful that all the pins of the 7407 and the components are wired correctly. Do not forget the pull-up resistors or the small capacitors. These help prevent power supply interference. If you wish, you can substitute small LEDs or 5 volt pilot lamps for the relays. This will allow you to see the ports in action.

Be sure to use an external power supply or 5 volt source. The ground of your source should be connected to the ground pin on the computer. You will not need the 5 volt pin. Incidentally, you can use the external supply to power your logic probe, and still read the computer logic signals at the ports.

Now For a Little Software

Listing 1 will provide you with a demonstration on how the ports are programmed. The program first allows you to select a port, and program it for either input or output. Then you can write data to the port and the computer will PEEK the port and verify the data you wrote. You can also do this by using the logic probe. You will get a logic 1 for every active bit in the port.

* * *

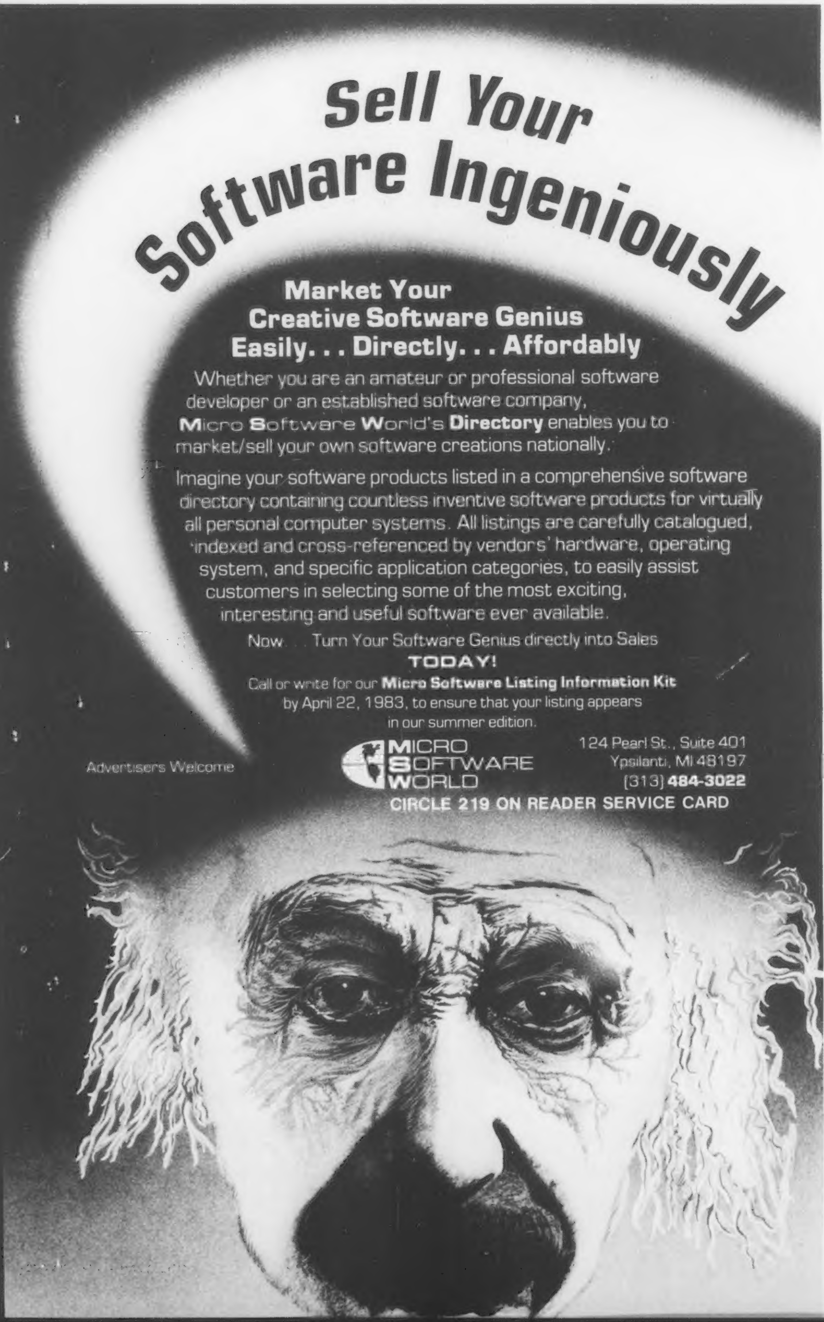
The Challenge is Met

In the February edition of this column, I posed a challenge to all Atari hackers for vast improvements upon my "super text mode" program. The first response I received was from Mike Portuesi, a 16-year-old Atari devotee from Mount Clemens, MI.

Mike succeeded in the task with satisfyingly little code. His version of the program accepts a user message as a string, modifies itself to include only the letters needed for that specific message, then deletes all extraneous lines. The user need only reposition those letters on the screen, which is a very simple process. Tinkering with sound values and plotting speed will result in a polished title card. Creating multiple cards is made dramatically less time-consuming.

The additions appear as Listing 2 (these lines must be added to the program appearing in the February Outpost).

"Miss Johnson, my quartz digital solid-state perpetual chronometer is on the blink again. What time is it?"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For a bit of background and a walk through the modifications, I now turn things over to Mr. Portuesi:

Operation of the program is simple. Simply RUN it, and the program will ask you to input your message. Use no blanks, please. There is a 21-character limit, because I figure that 21 is the maximum number of characters you can fit on the screen at once (3 × 7), but if you are using lots of skinny letters (like I), simply change the DIM statement at line 5. When it finishes running, you are left with a customized program.

The main challenge I faced in the modification was renumbering the DATA statements to fill the gap between line numbers 230 and 650. I couldn't live with repositioning the cursor and printing new line numbers. I would have gone insane trying to come up with a routine to account for missing lines and different line lengths. My program uses a different method, as follows:

1. Get message.
2. For each character of string:
   a. List to screen all associated DATA lines.
   b. Use forced-read mode to input lines into A$, B$, C$, and D$.
   c. Modify strings to set new line numbers.
   d. Print strings on screen.
   e. Force-read them into the existing program.
3. Delete lines 650 to 904.
4. Delete lines 5 and 859, then RESTORE data pointer to line 232.
5. Delete modification routine itself.

The forced-read mode is used not only to modify the program, but also to enter program lines into a string.

The following is a line-by-line explanation of the added lines:

5 DIM strings, GOTO 2000.

2000-2010 Get message from user.

2020 Loop for each character in the string.

2040-2050 List all lines relating to a specific letter.

2060 Enter these lines into A$, B$, C$, and D$, with forced read mode (using INPUT, not STOPping the program).

2070-2100 Put these lines back out on the screen.

2110-2120 Put these lines back out on the screen.

2150-2190 Delete lines 650 through 904, 20 lines at a time.

2220 Delete lines 5 and 859, change line 120 to RESTORE pointer.

2240 Delete first half of modification routine.

2250-2260 Delete rest of modification routine, stop program for user.

3000-3030 Modification subroutine.

A really big problem I had in development of the program is the infamous keyboard lock-up that occurs with repeated and heavy editing. This, coupled with the fact that I have only a cassette recorder, led to heartaches and frustration. I wish *somebody* would do something about that. For all the user-friendliness of Atari Basic, that bug almost makes me want to take the Basic cartridge, squirt it with lighter fluid, and take a match to it.

* * *

I know how you feel, Mike, and all I can say is I'm glad you stuck it out. Your approach to the problems I posed was unique and inspired. Good job, fella. You'll be receiving some review software from us very soon.

If you have no access to a February issue, dear reader, do not despair. Within the next couple of columns, we'll run a listing of the deluxe version of this program in its entirety. We will incorporate as many features as we can cull from our many entries. My thanks to all who participated.

One quick word of warning: remember to SAVE Mike's additions to the program before ever RUNning the modified program. As soon as it runs, it deletes the powerful parts of itself. Skip any testing until you put a file on disk. Otherwise, you too may be looking for the lighter fluid. ☐

Listing 1.

```
10 REM * PROGRAM TO FORMAT PIA PORTS
20 REM
30 GRAPHICS 0:POSITION 10,2
40 DIM IO$(10),DATA$(3)
50 PRINT "PIA PORT DEMO"
60 REM
70 REM PORT ADDRESS
80 REM
90 PORTA=54016:PORTB=54017
100 REM
110 REM * ROUTINE TO CONFIGURE PORT
120 REM
130 TRAP 130:PRINT :PRINT "Configure which port (1-4) "
140 INPUT PORT:IF PORT<1 OR PORT>4 THEN 130
150 REM
160 REM SELECT PORT CONTROL REGISTER
170 REM ADDRESS (PACTL,PBCTL)
180 REM
190 IF PORT<3 THEN PCTL=54018:PORT=PORTA
200 IF PORT>2 THEN PCTL=54019:PORT=PORTB
210 PRINT :PRINT
220 REM
230 REM SELECT INPUT OR OUTPUT
240 REM
250 PRINT "Input or Output ";
260 TRAP 250:INPUT IO$
270 IF IO$(1,1)="I" THEN F=0:GOTO 340
280 IF IO$(1,1)="O" THEN F=255:GOTO 340
290 GOTO 250
300 PRINT
310 REM
320 REM CONFIGURE THE PORT
330 REM
340 POKE PCTL,56
350 POKE PORT,F
360 POKE PCTL,60
370 PRINT :PRINT
380 REM
390 REM ENTER YOUR DATA
400 REM
410 IF  IO$(1,1)="I"  THEN  PRINT  "PORT  IS  FORMATTED  FOR
INPUT":PRINT :GOTO 130
420 PRINT "NOW ENTER YOUR DATA"
430 PRINT "(ENTER A RETURN TO DO ANOTHER PORT)"
440 INPUT DATA$:IF DATA$="" THEN PRINT CHR$(125):GOTO 130
450 TRAP 530
460 REM
470 REM POKE DATA TO PORT/VERIFY IT
480 REM
490 POKE PORT,VAL(DATA$)
500 PRINT "VERIFY ";PEEK(PORT)
510 GOTO 440
520 END
530 TRAP 40000:PRINT "INPUT ERROR, RE-ENTER ";:GOTO 440
```

Listing 2.

```
5 DIM STRING$(21),A$(120),B$(120),C$(120),D$(120):GOTO 2000
2000 ? CHR$(125):? "PLEASE ENTER YOUR STRING":? "(LESS THAN 21 CHARACTERS, PLEAS
E!)"
2010 INPUT STRING$:LINENO=232
2020 FOR I=1 TO LEN(STRING$)
2030 ? CHR$(125):POSITION 2,2
2040 FOR J=ASC(STRING$(I,I))*10+2 TO ASC(STRING$(I,I))*10+8 STEP 2
2050 LIST J:PRINT "":NEXT J:POSITION 2,3
2060 POKE 842,13:INPUT A$,B$,C$,D$:POKE 842,12
2070 A$(1,3)=STR$(LINENO):LINENO=LINENO+2
2080 B$(1,3)=STR$(LINENO):LINENO=LINENO+2
2090 C$(1,3)=STR$(LINENO):LINENO=LINENO+2
2100 D$(1,3)=STR$(LINENO):LINENO=LINENO+2
2110 ? CHR$(125):POSITION 2,2
2120 ? A$:? B$:? C$:? D$
2130 GOSUB 3000
2140 NEXT I
2150 PNTR=1:? CHR$(125):POSITION 2,2
2160 FOR I=650 TO 904 STEP 2
2170 ? I
2180 PNTR=PNTR+1:IF PNTR=20 THEN PNTR=1:GOSUB 3000:? CHR$(125):POSITION 2,2
2190 NEXT I
2200 GOSUB 3000
2210 ? CHR$(125):POSITION 2,2
2220 ? 5:? "120 RES. 232":? 859:GOSUB 3000
2230 ? CHR$(125):POSITION 2,2
2240 FOR I=2000 TO 2180 STEP 10:? I:NEXT I:GOSUB 3000
2250 ? CHR$(125):POSITION 2,2:FOR I=2190 TO 2260 STEP 10:? I:NEXT I
2260 FOR I=3000 TO 3030 STEP 10:? I:NEXT I:? "POKE 842,12:?CHR$(125)":GOTO 3000
3000 ? "CONT":POSITION 0,0
3010 POKE 842,13:STOP
3020 POKE 842,12
3030 RETURN
```

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APPLE ANNOUNCES LISA

After much unofficial buzzing, ballyhoo, and brouhaha, Apple Computer has officially announced Lisa, its 32/16 bit, mouse-based office microcomputer system.

At a cost of $9995, the product does not represent a price breakthrough, but it does offer state-of-the-art simplicity in a flexible and integrated system. Core business applications included for this price are spreadsheet analysis, word processing, business graphics, graphics design, personal filing, and project management.

The Lisa system was designed with ease of use as its prominent feature. It features an electronic mouse peripheral, which is moved on the desktop of the user to position a pointer on the screen. Icons, which are symbolic representations of data or programs, are manipulated via the mouse to invoke whatever functions are desired.

The business functions are fully integrated—for example, spreadsheet figures can be moved directly to a report being compiled in the word processor, and then to the graphics generator to be made into a chart. The chart can then be added to the report.

The core business packages are as follows:

- *LisaCalc*, an integrated spreadsheet program.
- *LisaWrite*, a word processing program with built-in spooling.
- *LisaGraph*, a spreadsheet graphing program.
- *LisaDraw*, an enhanced business graphics package.
- *LisaList*, a database program.
- *LisaProject*, a project management system.
- *LisaTerminal*, a communications program.

In addition to these packages, Lisa runs Basic, Pascal, and Cobol. It will support CP/M and Xenix operating systems, making a library of existing software available. An applications development toolkit will be available by the end of the year to aid the development of new integrated functions for the machine.

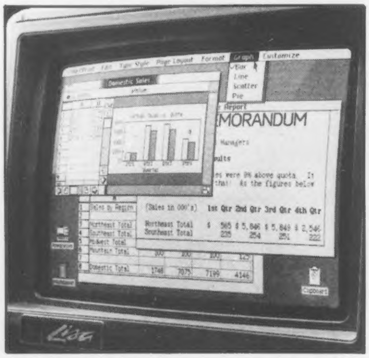
The heart and mind of Lisa is the MC-68000 CPU, a 32/16 bit microprocessor, containing 32-bit internal architecture and a 16-bit external data path. Input/output functions are controlled by three other microprocessor chips, freeing the 68000 of housekeeping overhead and thereby improving its performance capability.

This central architecture is combined with one megabyte (1000K) of RAM. Two built-in high-density 5 1/4" floppy disk drives combine to provide 1.7 megabytes of portable mass storage. These are the recently introduced 871 drives, which are said to be considerably faster than conventional models.

With the 5 1/4" ProFile hard disk unit added to the system, five megabytes are brought on-line, making it possible to run all applications concurrently and store them to a single hard disk.

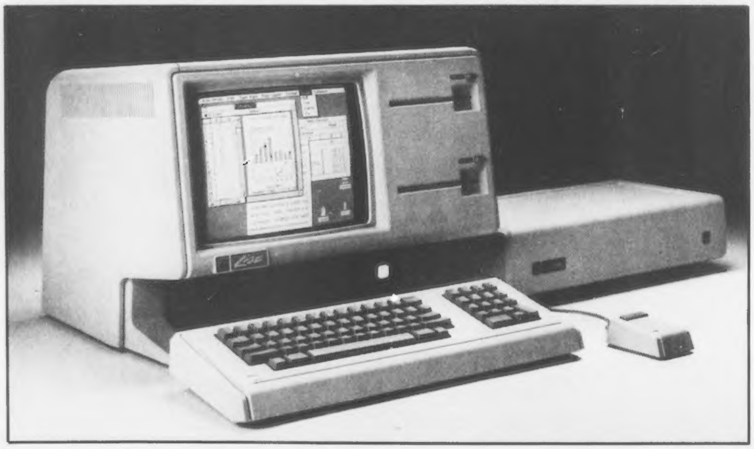
The unit features a 12", black on white, bit-mapped screen, with a resolution of 364 x 720. This allows character graphics of 132 columns by 40 rows. The mouse takes the place of special function keys, but the keyboard is programmable. It also includes a numeric keypad.

A modem will allow Lisa to function as a terminal, and *LisaTerminal* software will enable multiple Lisa units to communicate and share peripherals via the AppleNet networking system. Apple IIs and Apple IIIs can join in the communication too. Interfacing to the Xerox Ethernet system will also be possible. One parallel and two serial ports are provided. In addition, three expansion slots are available.



The Lisa has been under development since 1979, and over $50 million was spent on hardware and software research and development.

Its system of nested graphics windows and mouse are designed to create an unencumbered and straightforward means of data manipulation—one that the manufacturer hopes will gain favor in coming years as memory restrictions fall away and megabyte RAM microcomputer systems become commonplace.



CIRCLE 401 ON READER SERVICE CARD

TI PROFESSIONAL COMPUTER

A professional desktop computer, designed to be a personal productivity system for professionals, administrators, and other workers in information intensive business, has been introduced by Texas Instruments Incorporated.

The TI Professional Computer will sell for a suggested retail price of $2595 for a basic system consisting of a monochrome display, keyboard, system unit with 64K bytes of RAM, and an integral 320K floppy disk drive. This configuration is suitable for many professional applications, and can be upgraded for more complex applications by adding additional memory, mass storage, communications, and other options.

The system unit contains the 8088 central processor, memory, disk drive, and expansion options. Main memory can be expanded to 256K bytes. Space is provided for a second floppy drive or a 5Mb or 10Mb Winchester disk.

The TI Professional Computer features high-resolution graphics using a 12" monochrome display or an optional 13" color display. Both displays use the same format—25 lines of 80 columns, and 720x300 pixels with the graphics controller option.

A variety of communications options, including internal modems with automatic dial and answer capability and TTY and 3780 emulators, is available for the TI Professional Computer in network environments.

TI has also introduced an impact printer, the Omni 800 Model 850, as a companion printer. The Model 850 prints at up to 150 characters per second and offers a variety of fonts and print options. The 850 can also be used to print graphics designs from the computer display.

Additional options planned for introduction later this year inlude increased user memory and other input/output devices such as a mouse.

The TI Professional Computer supports MS-DOS, CP/M, Concurrent CP/M-86, and UCSD p-System. Among the third party applications software available are offerings from Ashton-Tate, BPI, Digital Research, IUS, Lifeboat, Micropro, Microsoft, Peachtree, Softech, Software Publishing Corporation, Sorcim, and VisiCorp.

In addition, the TI Professional Computer can use programs written for a CP/M-80 environment using a softcard supplied by Xedex Corporation.

Integrated applications software, including Lotus *1-2-3*, *Visi-on*, the *Oracle* relational data base system, and industry-specific applications are under development by third parties for introduction later in 1983.

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TI also previewed two "advanced ease-of-use capabilities," voice management and natural language, scheduled to be introduced in the third quarter of 1983.

The natural language capability is a user interface, derived from TI's research in artificial intelligence, that leads users to information by helping them ask questions in a natural way, combining common English words and phrases into sentences that tell the computer what to do. The user constructs sentences by choosing from words or phrases shown in a set of windows displayed on the video screen. The items that are selected from each window appear at the bottom of the screen as a plain English sentence describing the function to be performed.

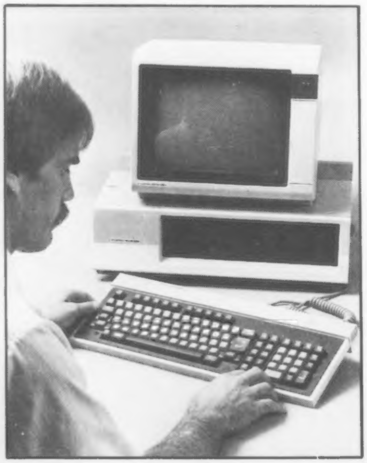
The voice management system combines speech processing, voice recognition and telephone management functions in a single unit which fits inside the computer. The system provides functions like voice store-and-forward, automatic dialing, telephone answering, and recognition of an unlimited number of spoken words and phrases.

Service for the TI Professional Computer will be provided by Texas Instruments' nationwide service organization and by qualified authorized dealers. Both on-site and depot service is available, and TI has established service depots specifically for the TI Professional Computer.

CIRCLE 402 ON READER SERVICE CARD

FUJITSU PERSONAL BUSINESS COMPUTER

Fujitsu has introduced the Micro 16S personal business computer. It has two microprocessors integrated to run under the CP/M-86 operating system, word processing and electronic spreadsheet software, and can operate existing 8- and 16-bit CP/M-based applications programs.



The 16S contains two user-accessible microprocessors, two 5 1/4" floppy disks with 320K bytes of formatted storage each, and 128K bytes of parity checking RAM memory, expandable to one megabyte. In addition, the Micro 16S has parallel and serial output ports and an advanced high resolution color graphics capability. It is compatible with all standard personal computer peripheral products. $4000.

Fujitsu Professional Microsystems Division, 2985 Kifer Road, Santa Clara, CA 95051. (408) 727-1700.

CIRCLE 403 ON READER SERVICE CARD

ATARI VCS TO COMPUTER ADD-ON

Stealing much of the thunder from the four companies that announced add-on units to convert the Atari Video Computer System to a "real" computer at CES, Atari announced their own add-on unit at the Toy Fair in February.

Dubbed "My First Computer," the Atari VCS add-on comes with 8K of memory, expandable to 32K. The keyboard has 56 "Chiclet-style," rubber keys but, unlike some other low-end units, does have a full-width spacebar. The unit has an interface to a standard cassette recorder and an expansion port on the left side into which an interface module can be plugged to connect with disk drives, printer, and modem. The entire unit sits on top of the VCS and does not have to be disconnected to play regular VCS games as it has a slot for game cartridges on top.

Built-in software includes a system monitor in 8K of ROM and Microsoft Basic (a first for Atari!) in another 8K. Twelve "super cartridges" will be available in the areas of home finance, personal development, education, and, of course, games.

Suggested list price will be under $90 and the system will be available in retail stores starting in September.

Atari, Inc., 1265 Borregas Ave., Sunnyvale, CA 94086.

CIRCLE 404 ON READER SERVICE CARD

CROMEMCO PERSONAL COMPUTER

Cromemco, Inc. has announced the C-10 desktop computer.

The C-10 is available in a package called the C-10 Super Pak which features a double sided, double density disk drive, a detachable keyboard, and several software packages. The basic computer unit includes an RS-232 serial port, a parallel port, and an RS-232 modem port with full handshake capability.

The software packages that are included in the Super Pak are a CP/M compatible operating system, Structured Basic, and three applications packages offered by Cromemco: *Writemaster*, a word processing package; *Planmaster*, a spreadsheet package; and *Moneymaster*, a stock/investment portfolio package.

The CRT display is a full 80-character by 25-line display. The system employs the Z80A microprocessor, operating at 4MHz, and 64K of RAM. $1785.

Cromemco Inc., 280 Bernardo Ave., Mountain View, CA 94043. (415) 964-7400.

CIRCLE 405 ON READER SERVICE CARD

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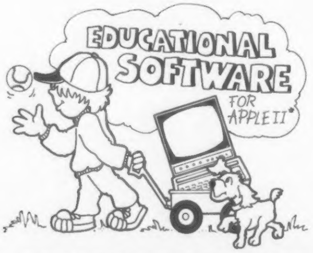

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*Apple II is a registered trademark of Apple Computer, Inc.

CIRCLE 183 ON READER SERVICE CARD

New Products, continued...

NETWORK COMPUTER

A handheld computer called the Network Inquirer has been developed by The Business Computer Network Corporation.

This small computer enables users to access hundreds of public databases, including The Source, Compuserve, Dow-Jones, UPI News and many others.

The Network Inquirer also offers electronic mail, enabling users to send correspondence to other users on-line, and receive mail automatically in its own electronic mailbox for retrieval at a later time.

The Inquirer is a microprocessor-based CRT terminal controller and features an integral 300 baud modem.

Other features include an RS-232 output to operate a serial printer simultaneously, channel selector, composite video output for CCTV monitors and a local test switch for self testing. $100.

The Business Computer Network, 211 South 4th St., Basin, WY 82410. (307) 568-2413.

CIRCLE 406 ON READER SERVICE CARD

MISCELLANEOUS

PRINTER MUFFLER

Trace Systems, Inc. has introduced SoundTrap, an acoustical housing that quiets printing noise to a level where a business or phone conversation can be conducted next to a functioning printer.

It accomodates most popular printers, including Epson, NEC, Okidata, IBM and Apple. $100.

Trace Systems, Inc., 1928 Old Middlefield Way, Mountain View, CA 94043. (415) 964-3115.

CIRCLE 407 ON READER SERVICE CARD

APPLE II INTERFACE CABLE

Cable Concepts Inc. has announced a 3-foot interface cable to connect the Apple II with its disk drive.

The cable is made with insulation displacement sockets with gold contacts and rainbow colored ribbon cable. $12.95.

Also available is a 10-foot extension cord for Atari joystick game controls. The cable works not only with Atari 400 and 800 computers but also with Commodore Vic 20 and Atari VCS. $14.95.

Cable Concepts, Inc., P.O. Box 427, Fraser, MI 48026. (313) 293-3911.

CIRCLE 408 ON READER SERVICE CARD

JOYSTICK CONVERTER

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NEW
TRIGGERSTIK
ARCADE STYLE JOYSTICK FOR YOUR ATARI

Triggerstik, as arcade-style joystick adapter for home video game use has been introduced by the Koch Company.

Triggerstik is designed to convert Atari and compatible joysticks to arcade-style operation, with the firing mechanism on the top. Two for $9.95.

Koch Company, 14252 Culver Dr., Suite A187, Irvine, CA 92714. (408) 244-6766.

CIRCLE 409 ON READER SERVICE CARD

APPLICATIONS SOFTWARE

BUSINESS

Micro Business Software, Inc. (MBSI), a former subsidiary of Mini Computer Business Applications (MCBA), has announced the availability of six general business software packages for use on Digital Equipment Corporation's emerging line of microcomputers.

The integrated business systems, which MBSI has entitled "RealWorld Software," are written in RM/COBOL and Micro Focus Level II COBOL and include Accounts Receivable, Accounts Payable, General Ledger, Order Entry/Inventory, Payroll and Sales Analysis.

The RealWorld applications will run in either language under both CP/M and CP/M-86 for the Rainbow 100 and will support the DECmate II with its CP/M card option.

On the LSI-11 based Professional 325 and 350, the Micro Focus Level II COBOL version will run under RSX-11m. And the RM/COBOL version runs on DEC's Micro-11 under RT-11.

A typical dealer license for this new MBSI package, including source code and complete documentation, is $1,000. MBSI, Dover Rd., Willow Hill Bldg., Chichester, NH 03263. (603) 798-5700.

CIRCLE 410 ON READER SERVICE CARD

The **Account82 CPA Client Write-Up Package** is available for use on all models of the Alpha-Micro computer. It includes a billing module which keeps track of computer usage by client, allows for CPA definition of charges by client, and prints invoices. **Account82** also allows definition of 12 classifications. $34.95. Pony Express Services, 2355 Salzedo St., Suite 307, Coral Gables, FL 33134. (305) 441-1784.

CIRCLE 411 ON READER SERVICE CARD

Howard W. Sams & Co., Inc. announces two new disk packages for use on Apple computers.

Financial Facts is a group of 18 mathematical programs designed to figure and print out reports for various loan, savings and investment plans.

Included in the package are programs covering depreciation, future value, interest rates, loans, payments, investments, deposits and withdrawal values. **Financial Facts** retails for $59.95.

Money Tools is a home or small business financial record keeping and reporting system.

Full reporting allows the user to track cash flow and to obtain breakouts of all financial areas as percent of total incomes or expenditures.

Budgets may be created with the system to help guide spending within any time frame.

120 budget areas can be created, 12 recording periods handling 500 transactions per period. Retail price is $59.95. Howard W. Sams & Co., Inc., 4300 W. 62nd St., P.O. Box 7092, Indianapolis, IN 46206. (317) 298-5400.

CIRCLE 412 ON READER SERVICE CARD

WORD PROCESSING

Heath Company has announced **Magic Spell**, an automatic proofreader for the *Magic Wand* Word Processing System. **Magic Spell** helps users isolate spelling and typographical errors in documents produced by *Magic Wand*, verifying the correct spelling of words in a document.

Available on soft-sectored 5.25" floppy disk or soft-sectored floppy disk, **Magic Spell** operates on a Heath/Zenith H-8/H-19 or H/Z-89 computer system. Heath Co., Benton Harbor, MI 49022. (616) 982-3210.

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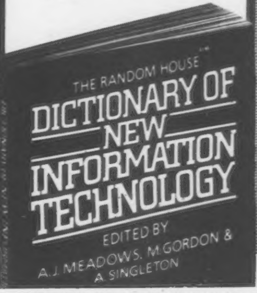
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CIRCLE 306 ON READER SERVICE CARD

New Products, continued...

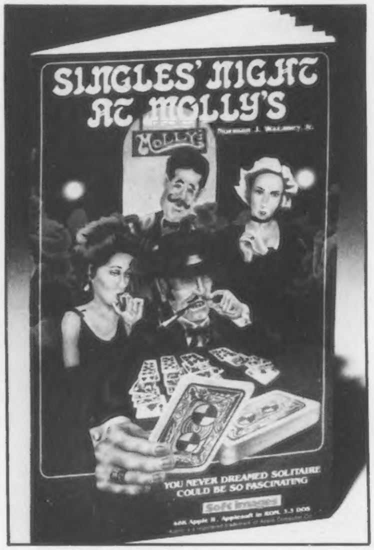
The **LEX-11** word and data processing software package is now available for the DEC Professional computers. It is available under the new P/OS operating system and features a full screen editor, list processing and database management, business graphics, and a visual calculator. Optional with the P/OS version of **LEX-11** is an introductory on-line training guide which will cost $200 and a spelling checker for $200. $850. EEC Systems, Inc., 327/E Boston Post Rd., Sudbury, MA 01776. (617) 443-5106.

CIRCLE 414 ON READER SERVICE CARD

GAMES AND RECREATION

Radio Shack offers adventure game buffs a new and challenging program for the TRS-80 Color Computer. **Sands of Egypt** for the TRS-80 Color Computer features colorful animated graphics which serve as the background as the player roams the desert dunes in search of treasure. $29.95. Available at Radio Shack stores and computer centers.

Singles Night At Molly's consists of two solitaire card games which can be played by one person, or any number of players. Royal Flush is played with a deck of 52 cards, a control deck, and a five-by-five game board matrix. The object of the game is to place 25 randomly dealt cards onto the matrix in such a way as to achieve the highest possible score. Sly Fox is played with two standard 52-card decks and a 228-slot playing board matrix. The object of the game is to make four piles of cards, each of which contains 13 cards in suit and rank order from the King to the Ace and four piles of cards from the Ace to the King. The package requires a 48K Apple II/II Plus with Applesoft in ROM or a Language Card and DOS 3.3. $29.95. Soft Images, 200 Route 17, Mahwah, NJ 07430. (201) 529-1440.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MOLLY'S
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CIRCLE 415 ON READER SERVICE CARD

In **Aqua Run**, for the IBM Personal Computer, the player seeks treasure in an undersea world while spearing or avoiding vicious creatures. This game is playable from the keyboard or with a joystick on the IBM PC with 64K RAM, one disk drive, a color/graphics adapter, and a TV or monitor. The game control adapter is required if a joystick is used. $39.95. Soft Spot Micro Systems, P.O. Box 415, North Canton, CT 06059. (203) 379-7047.

CIRCLE 416 ON READER SERVICE CARD

Crossword Wizard, for the Osborne 1, helps puzzle-solvers who find themselves stuck for a particular word. The user enters the letters he knows along with a word description. Working from these

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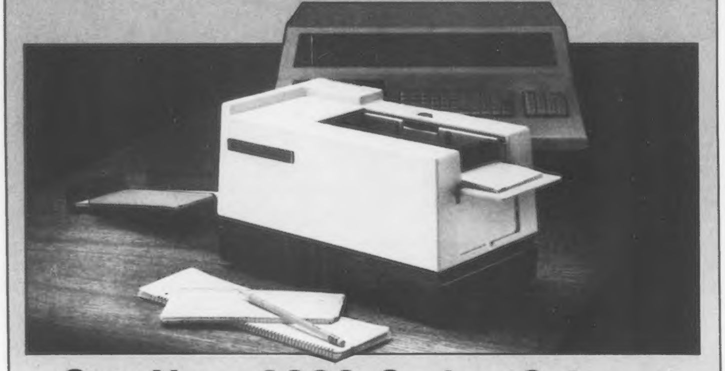

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20710 Lassen Street Chatsworth, California 91311 Phone: (213) 341-9200

CIRCLE 135 ON READER SERVICE CARD

clues, the program provides lists of all possibilities from its changeable/expandable (to 80K) built-in dictionary. $34.95 for two disks. Eastern Indiana Computing Services, 202 Kehl St., Suite 2, Connersville, IN 47331.

CIRCLE 417 ON READER SERVICE CARD

Written in machine language and Basic for IBM Personal Computers with PC-DOS, 64K RAM and monochrome or color/graphics cards, **Microcosm** is based on a simulation of birth, life, migration, and death among populations of microorganisms. $39.95. Aeon Concepts, P.O. Box 12595, Pittsburgh, PA 15241. (800) 547-5995.

CIRCLE 418 ON READER SERVICE CARD

Software Magic has introduced **Kong**, a machine code arcade game for the 16K Level II Model I or Model III TRS-80. The player must reach the top of a building where a gorilla holds girl captive. $19.95. Software Magic, P.O. Box 2184, Bramalea, Ont., Canada L6T 3S4. (416) 451-9452.

CIRCLE 419 ON READER SERVICE CARD

The object of **Astro-Dodge** for the IBM PC is to score points by destroying meteoroids and ships.

It requires 64K RAM, a Color-Graphics card, and separate black-and-white or color monitor. $39.95. Digital Marketing Corp., 2670 Cherry Lane, Walnut Creek, CA 94596. (415) 938-2880.

CIRCLE 420 ON READER SERVICE CARD

Battle For Normandy, a game for TRS-80, Atari, or Apple, takes players to the northern coast of France to recreate the D-Day invasion. The game is programmed for a 25-day time period (June 6 to 30, 1944) in which time the player must penetrate as deeply as possible into the continent and capture the port of Cherbourg and the towns of St. Lo and Caen. Available on disk or cassette for $39.95. In **Germany 1985** Soviet battalions have invaded the southern center of West Germany with infantry, tanks, artillery units, and paratroopers. In order to halt this invasion NATO must step in. The game comes complete with a disk, two-sided map, data card, and a rule book. $59.95. Strategic Simulations Inc., 465 Fairchild Dr., Suite 108, Mountain View, CA 94043. (415) 964-1353.

CIRCLE 421 ON READER SERVICE CARD

Tronix has introduced three games for the Vic 20. In **Swarm** players must contend with deadly android wasps, aided by alien creatures of every description. $29.95. In **Sidewinder**, players lead their squadron of skilled helicopter commandoes into deadly battle with killer pods in outer space. $29.95. **Galactic Blitz** pits the player against a squadron of killer aliens who attack en masse. The aliens include

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A Connoisseur's Guide

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LP-10* low cost no switch, Light Pen is active at all times.

LP-15 High Resolution, high speed Light Pen with push switch to activate signal. It is super-sensitive and can control the curser 6 inches from screen.

LP-10 . . . $39.95
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CIRCLE 273 ON READER SERVICE CARD

New Products, continued...

Heartattacks, Pearons, Energridders, Beheadhinds and Towelships. $24.95. Tronix Publishing, Inc., 701 West Manchester Blvd., Inglewood, CA 90301. (213) 671-8440.

CIRCLE 422 ON READER SERVICE CARD

EDUCATIONAL

New Classics Software has introduced a language package specifically for high schools that will be offering Advanced Placement Computer Science courses. The package is based on an upgraded version of **Pascal 80** that now includes pointer variables. The package will work on the Radio Shack Model I or III computer, requiring 48K and one disk drive. It can be used with the Network III controller. The package costs $295, and an individual version is available for $101. New Classics Software, 239 Fox Hill Rd., Denville, NJ 07834. (201) 625-8838.

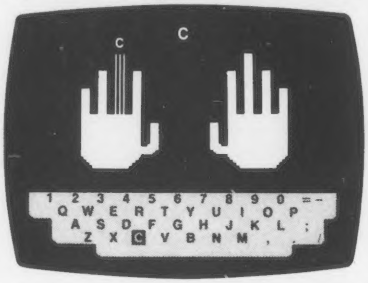
PASCAL 80
NEW CLASSICS SOFTWARE

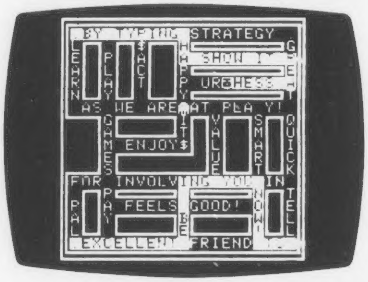
CIRCLE 423 ON READER SERVICE CARD

Children through adults can study the Bible with Personal Computer Management's series of programs for the Apple II and Atari computers. Titles include **Great Men of the Bible, Great Women of the Bible**, the **Book of Acts**, the **Life of Christ** and general Bible studies. All require 48K of memory with a disk drive, and retail for $29.95 each. Personal Computer Management Corp., 1171 Sonora Court, Sunnyvale, CA 94086. (408) 732-9222.

CIRCLE 424 ON READER SERVICE CARD

Two touch typing software packages are offered by Behavioral Engineering. Beginning level programs in **Typing Strategy** use an animated image of the keyboard and a pair of hands to teach finger-key-character relationships. More advanced typists can increase their speed playing Drag Race and Time Bomb. **Letter Man**, based on the Pac-Man arcade game, teaches typing through play. The user is placed in a maze filled with words, letters and numbers, and must escape pursuing Gobblers by typing the character adjacent to the Letter Man figure. Both packages have full authoring capabilities which allow the user to introduce special sets of words and phrases for practice, such as medical or legal terminology. Available for the Apple II, IBM PC, Vic-20, and Commodore 64. $29.95 each, $24.95 for the VIC-20. Behavioral Engineering, 230 Mt. Hermon Rd., Suite 207, Scotts Valley, CA 95066. (408) 438-5649.





CIRCLE 425 ON READER SERVICE CARD

Control Data has announced nine lessons from their Plato library for use on the Apple II Plus, Atari 800 and Texas Instruments 99/4A computers. **Basic Numbers Facts, Whole Numbers, Decimals, Fractions, Physics: Elementary Mechanics, French Vocabulary Builder, German Vocabulary Builder, Spanish Vocabulary Builder,** and **Computer Lit-**

eracy: Introduction cover skills from the elementary to the high school level. The programs initially will be sold through mail order for $45 for a single lesson and $35 for additional lessons. Control Data Corporation, 8100 34th Ave. South, P.O. Box 0, Minneapolis, MN 55440. (612) 853-4541.

CIRCLE 426 ON READER SERVICE CARD

Borg-Warner Educational Systems has announced four new titles in its library of MicroSystem80 courseware. **Geometric Concepts**, which consists of two disks with management systems that will maintain records for up to eight class groups of fifteen students each, provides instruction and practice in measurements concepts and their formulas. **Sentence Structure** is an eight-disk series which helps middle grade students achieve proficiency in basic sentence analysis skills. **Elementary Language Arts** and **Junior High Language Arts** are comprehensive eight-disk classroom programs. The programs require the 48K Apple II with 3.3 DOS, 5 1/4" disk input and video display. Borg-Warner Educational Systems, 600 West University Dr., Arlington Heights, IL 60004. (312) 394-1010.

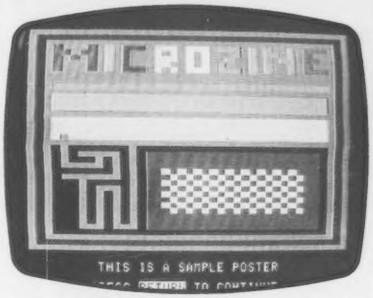
BORG WARNER

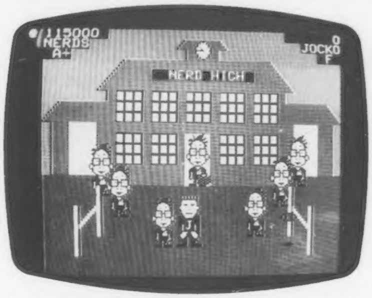
CIRCLE 427 ON READER SERVICE CARD

Benji, the dog made famous by a motion picture, battles alien beings while teaching players about the solar system in **Benji—Space Rescue** from ISA Software. Features include high resolution graphics, sound effects, and music. The program is the first in the Benji Discovery Series for use on the Commodore 64, Vic-20 and Atari 400 and 800 computers, and retails for about $50. ISA Software Inc., 14114 Dallas Parkway, Dallas, TX 75240. (214) 960-6696.

CIRCLE 428 ON READER SERVICE CARD

Scholastic has announced the Wizware series of programs for the Apple II Plus, Atari 800/400, TI 99/4A and Vic-20 computers. Children can program the outcome of an adventure story or interview a popular personality in the news with **The Microzine**, a computer "magazine" which allows them to participate in each of its features. By matching numbers, words and patterns, younger users become familiar with logical concepts in **Square Pairs**. With **Turtle Tracks**, children learn the fundamentals of computer programming as they draw shapes with a "turtle" control. The lessons continue with **Your Computer**, a hands-on introduction to computer technology for first-time users. **Electronic Birthday** leads party activities such as pin-the-tale-on-the-donkey, and in **Nerd Alert** the Nerds must be blocked or they will take over the local high school. $40 for disk, $30 for cartridge. Scholastic, Inc., 730 Broadway, New York, NY 10003. (212) 505-3000.





CIRCLE 429 ON READER SERVICE CARD

Insoft has introduced a series of educational games for the IBM Personal Computer. In **Wordtrix**, the user vies with the computer to find words in a random grid of letters. Following clues from crossword puzzles, trivia questions, and foreign word translations, **Quotrix** players try to guess a famous quote by piecing together each discovered word. Each package retails for $34.95. In **Grapple**, players must stop the Horrible Hoppers, Sneaky Snerds and Flippant Flyers from escaping the intergalactic prison. This program also runs in emulation mode on the Apple III. $29.95. Insoft Inc., 10175 SW Barbur Blvd., #202B, Portland, OR 97219. (503) 244-4181.

CIRCLE 430 ON READER SERVICE CARD

Bertamax has released two packages for the TRS-80 Color Computer. **Essential Mathematics Series** for grades 6-8 is a Drill-and-Practice program containing lessons in addition, subtraction, multiplication, division, number concepts, frac-

Micro
Technology Report

Programmer Productivity Multiplied

Langhorne, PA — Quic-N-Easi Products Inc. announced availability of a complete Applications Development System called Quic-N-Easi PRO. The package is designed to help professional programmers make a lot more money by multiplying productivity.

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CIRCLE 296 ON READER SERVICE CARD

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CIRCLE 223 ON READER SERVICE CARD

New Products, continued...

tions, decimals and percent, and pre-algebra skills. Features include on-screen directions and examples, sound and color reinforcers and a Teacher's manual. The series is also available for the Apple and TRS-80 Model III. A complete set of lessons costs $225 on disk and $245 on tape. Each individual program sells for $59.80 on disk and $89.50 on tape. **Math Facts Games I** provides practice in addition, subtraction, multiplication, and division. The user can also select from four games: Count Down, Mystery Word, Tic-Tac-Toe and Great Computer Challenge. The program requires Extended Basic and 32K of memory. It is available in TRS-80 Model III, Apple II and Atari 800 versions. Tape, $39.50. Disk, $39.80. Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109. (206) 282-6249.

CIRCLE 431 ON READER SERVICE CARD

The Reading Machine, for the Apple II, contains over 28 reading skill levels ranging from alphabet matching and sequencing to blends and digraphs. Features include high-resolution graphics pictures to match words, large size upper and lower case letters, record keeping and management systems and instructional materials for parents and teachers. Recommended for grades K-3. $59.95. SouthWest EdPsych Services, Inc., P.O. Box 1870, Phoenix, AZ 85001. (602) 253-6528.

CIRCLE 432 ON READER SERVICE CARD

With **Delta Drawing**, children create colorful drawings on the computer screen using single keystroke commands to control the cursor. Drawings can be saved on a disk and printed—if a graphics printer is available. Compatible with Apple, Atari, and IBM systems, it retails for $59.95. Spinnaker Software Corp., 215 First St., Cambridge, MA 02142.

DELTA DRAWING
SPINNAKER
We make learning fun.

CIRCLE 433 ON READER SERVICE CARD

Designed to help master the art of music, **Music Games** incorporates 12 programs covering movement on a staff, recognition of notes and rhythm, measures, and musical pitches. Color graphics and sound reproduction aid recognition of notes and rhythms. The package requires an Apple II with Applesoft or Apple II+, 48K and disk drive. $39.95. Howard W. Sams & Co., Inc., 4300 W. 62nd St., P.O. Box 7092, Indianapolis, IN 46206. (317) 298-5400.

CIRCLE 434 ON READER SERVICE CARD

Disk Depot has released **Multiplication Facts Diagnostic** for the Applesoft with DOS 3.3 (or Hyper Dos) computer. The program is designed to diagnose a student's multiplication weaknesses or strengths, and will print out a cure for the problem. Teachers can choose from nine levels of achievement, and when a student has successfully completed a level, a "Certificate of Mastery" is issued on the printer. Sound is optional. $49.95. Disk Depot, 731 West Colorado Ave., Colorado Springs, CO 80905.

CIRCLE 435 ON READER SERVICE CARD

Game Power For Phonics is a reading skills program for the Apple II and TRS-80 computers. Each game format focuses on a single skill and may be played seven ways with emphasis on word recognition, non-verbal and verbal responses, comprehension, sentence improvisation, articulation, and spelling. The package includes a score-keeping system to record the student's progress and a manual with 1280 language games. $28.50. The **Button Box Phonics Test Kit**, useful in identifying a student's specific phonics difficulties is also available for $10. Spin-a-test Company, 404 Old Orchard Court, Danville, CA 94526. (415) 837-4532.

CIRCLE 436 ON READER SERVICE CARD

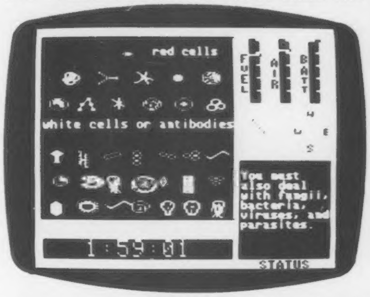
M-R Information Systems announces **MicRo Math Blaster**, a learning game for the Vic-20. It is a combination of an arcade game and basic mathematic drill in addition, subtraction, multiplication and division. Levels of difficulty include grades 1-8. M-R Information Systems, Inc., P.O. Box 73, Wayne, NJ 07470. (201) 696-3296.

CIRCLE 437 ON READER SERVICE CARD

The Microgroup has announced educational software programs which allow up to eight students to share a single microcomputer while developing skills in mathematics, language arts, science and social studies. The 52 Microgroup programs operate on Atari 400/800 computers with at least 16K memory. Games include Word-Draw, Math-Hunt, and Picture-Play and can be played both cooperatively and competively. Edupro, P.O. Box 5136, Palo Alto, CA 94303. (415) 494-2790.

CIRCLE 438 ON READER SERVICE CARD

Fantasy adventure, arcade action, and medical science are all combined in **Microbe: The Anatomical Adventure** for the Apple II computer. A miniaturized submarine is injected into the human body and its crew (the student) must find and rid the body of diseases and repair damage to the brain. Three levels of play are available. The first level leads the crew on an exploration of the human body as they attempt to overcome obstacles, the second teaches facts about health care, personal safety, anatomy and medicine, and the third is geared towards college level science and medical students. The package sells for $44.95. Synergistic Software, 830 N. Riverside Dr., Suite 201, Renton, WA 98055. (800) 426-6505 or (206) 226-3216.



You must also deal with fungii, bacteria, viruses, and parasites.

CIRCLE 439 ON READER SERVICE CARD

Spinnaker has introduced two educational software packages for children. **Rhymes & Riddles** is a letter guessing game presented in three formats: Jokes and Riddles, Nursery Rhymes, and Famous Sayings. Each game is designed to help children spell as well as learn words to nursery rhymes and popular sayings. The six games included in **KinderComp**, for youngsters 3-8, feature sound and animation as the child develops drawing, number and matching skills. Each of these packages sells for $29.95 and is available in Apple, Atari and IBM versions. Spinnaker Software, 215 First St., Cambridge, MA 02142. (617) 868-4700.

CIRCLE 440 ON READER SERVICE CARD

Type-It is a touch typing course for the 16K TRS-80 Model I and Model III computers. A video display provides the student with instructions, exercises, typing areas and progress reports. The program also allows the user to test his typing speed for an interval of up to ten minutes. It is available on diskette or cassette for $20 and on TRSDOS diskette for $35. Bluebirds Computer Software, 2267 23rd St., Wyandotte, MI 48192. (313) 285-4455.

CIRCLE 441 ON READER SERVICE CARD

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CIRCLE 313 ON READER SERVICE CARD

New Products, continued...

In **The Doctor Game**, patients come to the doctor for help and become better or worse depending on the diagnosis and treatment by the player. The package includes a full tutorial on the use of lab testing facilities and a glossary of common medical terms used in the game. The game requires a Apple II with 48K and requires a disk drive, $27.95. Simulation Software Co., 6035 N. Maplewood Ave., Chicago, IL 60659.

CIRCLE 442 ON READER SERVICE CARD

Sofcrates: The Courseware Creator, an Apple II authoring system, allows teachers to create lessons without programming. Copyable lesson disks feature glossary, multi-font color text, questions with remediation, graphics, animation, student-initiated branching, and progress tracking. Interactive video and networking capabilities which can be added to existing systems will be available in mid-1983. $199. Simpac Educational Systems, Suite 11-C, 1105 N. Main St., Gainesville, FL 32601. (904) 376-2049.

CIRCLE 443 ON READER SERVICE CARD

PERSONAL

E-Z Tax is a personal income tax preparation program capable of doing the 1040A (short form), the 1040EZ form (the new IRS form for single tax payers), and over 25 other IRS forms and schedules.

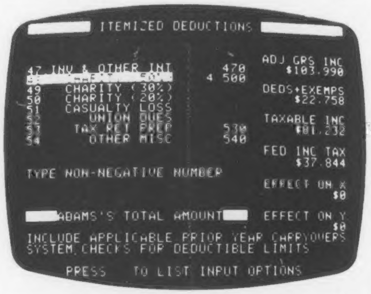
It is compatible with Apple, Atari, IBM, and CP/M based systems. $69.95. E-Z Tax, 2444 Moorpark Ave., Suite 208, San Jose, CA 95128. (408) 998-1040.

CIRCLE 444 ON READER SERVICE CARD

HomeTax is a self-teaching personal income tax preparation system from Learning Shack. The program prompts the user on all necessary tax questions and processes the information required for completing tax returns. The special 1040 transparency provided in the package can be used over printout reports to create finished tax returns on a copy machine. A "Tax Planning Strategies Manual" and a report that lists deductible uses for computers are also included. The system runs on most CP/M computers with dual disk drives and at least 48K RAM. (Apple II requires Softcard.) $95. Learning Shack, Inc., 17981-J Sky Park Circle, Irvine, CA 92714. (800) 782-8678 or (714) 966-6631.

CIRCLE 445 ON READER SERVICE CARD

Taxmode computes Federal income taxes for 1982 and later and includes the provisions of TEFRA of 1982 and inflation indexing beginning in 1985. Results are displayed on the screen after each entry, along with instructional input explanations. The package is available for the Apple II+ with 48K RAM and DOS 3.3. $250. J.P. Sawhney & Co., Inc., 888 Seventh Ave., New York, NY 10106. (212) 541-8020.



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CIRCLE 265 ON READER SERVICE CARD

The Tax Planner allows users to determine the impact of Federal Income taxes upon a given investment proposal. The program computes single year income taxes and shows tax effects for five years. It can be used with the IBM PC, Apple II and Apple III computers and retails for $300. Money Tree Software, 550 SW Fifth, Corvallis, OR 97333. (503) 757-1114.

CIRCLE 447 ON READER SERVICE CARD

IBM has released several new software packages for the IBM PC. **Multiplan** by Microsoft is a spreadsheet simulator for numeric modeling and planning. It does projections, performs what-if sensitivity analyses, budget and resource planning, scheduling and many other tasks that involve extensive manipulation of numbers and formulas. $250. **pfs: File** by Software Publishing Corporation is an information management program with which users can design forms for data and enter, retrieve, modify and print information for business, professional, home and education requirements. $140. **pfs: Report** by Software Publishing Corporation enables users to produce custom reports from files created by **pfs:File**. Up to 16 columns may be printed in a user-defined sequence. Column averaging, counts, subtotals, and grand totals are easily derived. $125. **Personal Editor** is a full screen editor for creating and editing of programs as well as documents. $100. The **Basic Programming Development System** contains four utilities: Text File Editor, Structured Basic Pre-processor, Basic Formatter, and Basic Cross-Reference. With these utilities, advanced programmers can write, edit and pre-process Basic programs, format a program and produce a cross reference listing of its variables, statements and keywords. $130. **Diskette Librarian** creates and maintains a catalog of file names for people using a substantial number of diskettes. $45. IBM Corp., P.O. Box 1328, Boca Raton, FL 33432.

CIRCLE 448 ON READER SERVICE CARD

Radio Shack has introduced the **Electronic Broker** software package for the TRS-80 Model II. Electronic Broker reviews and updates security prices, market averages, split stocks and adjustments for dividends. Four libraries of information are built and maintained by the program: a client accounts library (up to 500 client accounts), a securities library (for up to 500 securities), an ongoing transactions file and a matched-off liquidations file. The program also prepares printed client portfolio statements for position summaries, tax lots, a buy and sell blotter, a posting journal and a liquidations report as an audit trail. $995. Available at Radio Shack stores and computer centers.

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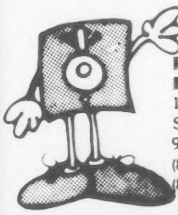

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le cart...apple cart...apple

Steve Prescott

> *This month our guest Apple Cart tutor is Steve Prescott who presents a tutorial and short program to change colors on the Apple hi-res screens—EBS*

Are you interested in high-resolution graphics? Would you like to be able to change all the colors on either of the hi-res screens automatically? Are you perhaps even slightly interested in (dare I say it) *machine language?* If you can answer yes to any of these questions, I'm sure you will be interested in the short program that follows. The program is called Farbe Flipper, and by taking a mere fifteen minutes to type it in now you will gain an easy yet powerful graphics utility for life.

You may be wondering why I chose the name Farbe Flipper. "Flipper" you understand, but "Farbe?" Let me give you a hint: don't even try looking it up unless you happen to have a German dictionary around, because *Farbe* is the German word for color. All right, now that we've cleared the first obstacle, let's attempt to understand the important thing: the program.

Memory: What is a Byte?

Part of Farbe Flipper is, as I have hinted, written in machine language and, as the program is going to work with the actual little memory "boxes" in which pictures are stored, it seems in order to try to understand just how the Apple saves a picture.

The first thing you should know is how information is stored in a computer. There are small packets of information called *bytes,* and inside each byte are eight smaller packets called *bits.* As the name implies, a bit is a very small piece of information. It is either a one or a zero. A typical byte, therefore, would look something like this:

```
10110010
```

Now that you know how information is stored, let's look at how the Apple uses these little packets to store a picture.

Hi-Res Graphics: Bit-by-Bit

What I will discuss here is also explained on pages 19 and 20 of the Apple II Reference Manual, but I will provide a slightly more detailed explanation.

Steve Prescott, 2 Creekside Lane, Camp Hill, PA 17011.

If you have ever programmed in Basic, you may know that there are two hi-res screens (HGR, HGR2). Inside the Apple, there are actually two totally separate places in which these pictures are stored. The first or primary page starts at the ghastly number of 8192 and goes to 16,383: the second or secondary page starts at 16,384 and continues up to 24,575. At first glance, these numbers can be quite intimidating, but they are actually addresses just like your house number, and a picture on the screen is stored in a series of bytes between the beginning and ending addresses.

"Wait a second," you may say, "the picture is stored there? Uh . . did I miss something?" No, don't worry, I'm getting to that part. The above numbers are nice to know, but there is a much easier way to remember them, and luckily in machine language we can use the easier way.

The easier way is in hexadecimal (base 16). Take 8192, for example: In hexadecimal, 8192 is equal to $2000, and that is a great deal easier to remember. The dollar sign is there to remind you the number is in hexadecimal. Figure 1 is an easy-to-use chart for all the important hi-res addresses:

Page 1	Page 2
Start: 8192 ≈ $2000	Start: 16,384 ≈ $4000
End: 16,383 ≈ $3FFF	End: 24,575 ≈ $5FFF

What follows is a much simplified explanation of the color switching process, but it is adequate for my purpose. A byte, as I said, has eight bits, and for hi-res graphics each of seven of the eight bits represents one point on the hi-res screen. The eighth bit is used to select which color the points will be.

To change the colors on the screen, all we have to do is switch all the ones to zeros and all the zeros to ones inside a hi-res byte. This is done with an EOR or Exclusive-OR instruction. What an EOR does is compare two bits, and if neither of them is equal to one or if both are equal to one, the answer is equal to zero, but if only one of them is equal to one, the answer is also equal to one. This is concisely summarized in the following truth table:

		First Bit	
		0	1
Second Bit	0	0	1
	1	1	0

What is important is that whenever you EOR a bit with a one, it will change to the opposite state; ie., a one will change to a zero, and a zero will change to a one. Now you just extend that

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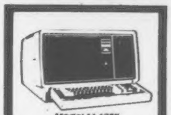

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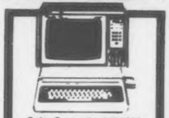

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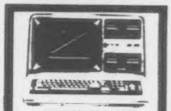

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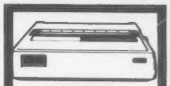

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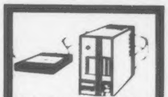

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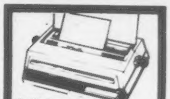

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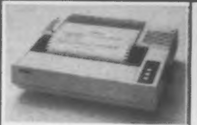

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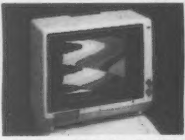

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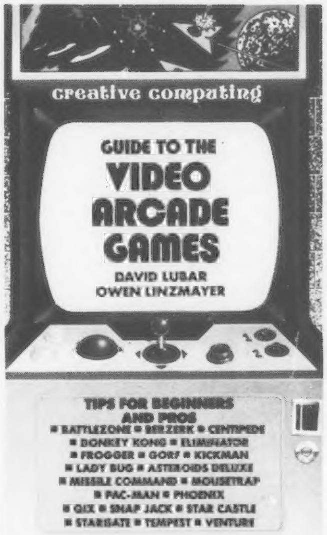

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Apple Cart, continued...

idea. Since we want to change the state of every bit in the byte, we can EOR our byte with 11111111, which in hexadecimal is $FF. For example, if I EOR our sample byte, I get:

```
1 0 1 1 0 0 1 0
1 1 1 1 1 1 1 1
0 1 0 0 1 1 0 1
```

(Sample byte)
(EOR with $FF)
(Result)

Notice that the result is the opposite of the sample byte, just as we thought it would be. Once you understand this concept, you have the key to the entire Farbe Flipper program.

Listing 1.

```
*300L

0300-   A9 00         LDA   #$00
0302-   85 1A         STA   $1A
0304-   A9 20         LDA   #$20
0306-   85 1B         STA   $1B
0308-   A0 00         LDY   #$00
030A-   B1 1A         LDA   ($1A),Y
030C-   49 FF         EOR   #$FF
030E-   91 1A         STA   ($1A),Y
0310-   E6 1A         INC   $1A
0312-   D0 F6         BNE   $030A
0314-   E6 1B         INC   $1B
0316-   A5 1B         LDA   $1B
0318-   C9 40         CMP   #$40
031A-   D0 EE         BNE   $030A
031C-   60            RTS
031D-   00            BRK
031E-   00            BRK
031F-   00            BRK
0320-   00            BRK
0321-   00            BRK

*300.31C

0300- A9 00 85 1A A9 20 85 1B
0308- A0 00 B1 1A 49 FF 91 1A
0310- E6 1A D0 F6 E6 1B A5 1B
0318- C9 40 D0 EE 60
```

Machine Language

The machine language program which uses the color-switching process described above is a fairly straightforward yet useful introduction to a low level language. I will go through the program one line at a time and explain each one.

```
0300-  A9 00     LDA #$00
```

LDA #$00 means LoaD the Accumulator with the number zero. The accumulator is really just a machine language variable, so a comparable Basic statement would be 300 A=0

```
0302-  85 1A     STA $1A
```

STA $1A means STore the Accumulator in memory location $1A. The dollar sign, remember, signifies hexadecimal, and the first two lines are really putting a zero into $1A so that we can use it later.

```
0304-   A9 20      LDA #$20
```

LDA #$20 means LoaD the Accumulator with the number 20. The zero which had been in the accumulator is automatically erased when the 20 is loaded.

```
0306-   85 1B      STA $1B
```

STA $1B means STore the Accumulator which is now equal to #$20 in location $1B, which is the location immediately following the one in which the zero was stored. After these first four instructions, memory locations $1A and $1B would be as follows:

$1A	$1B
#$00	#$20

The way we are going to change the color of every point on the screen is by EORing each byte with #$FF, but we need some way of telling the Apple which byte we want to change. To go through the memory byte-by-byte, we will use indexed indirect addressing. What this does is not actually address each byte individually, but rather address it by how far away it is from the beginning of a block of memory.

The #$00 and #$20 that we put into $1A and $1B were the beginning pointers, except that they are backwards. (They have to be for indexed indirect addressing.) If you reverse the numbers and put them together, you get #$2000, which should look familiar as it is the beginning of the primary hi-res graphics screen.

Okay, let's see if we understand everything so far: to change the color of every point, we are going to EOR each byte with #$FF. In order to EOR each byte, however, we must address it (find it), and for that we use indirect indexed addressing.

The addressing method has two parts, the beginning pointers and the offset pointer. The beginning pointers must be stored backwards in the zero page (the beginning of the Apple's

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Apple Cart, continued...

memory), and we did that by storing #$00 and #$20 in $1A and $1B respectively. Okay, but what about the offset pointer? I hope that is what you are wondering, because that is what we are going to do right now.

```
0308-   A0 00      LDY #$00
```

LDY #$00 means LoaD the Y register with the number zero. The Y register is another machine language variable, just like the accumulator, so a comparable Basic statement would be 308 Y=0

In this program, we will use the Y register as the offset pointer, as you will see right now.

```
030A-   B1 1A      LDA ($1A),Y
```

LDA ($1A),Y finally uses the indirect indexed addressing to LoaD the Accumulator. It loads the accumulator with the byte whose address is the numbers in $1A and $1B plus the Y register. For example, right now $1A and $1B are $2000 and the Y register is #$00, so:

```
  $2000 (beginning pointer)
+ #$ 00 (offset pointer)
  $2000 (result: byte to be loaded)
```

and the accumulator will be loaded with the information in byte $2000. Now that we have the hi-res byte, let's change the colors.

```
030C-   49 FF      EOR #$FF
```

This is the basis of the entire program, and as I have shown, it changes every bit in the accumulator to the opposite state. Now that the byte is changed, all that remains is to store it back in its place and get the next byte.

```
030E-   91 1A      STA ($1A),Y
```

STA ($1A),Y means STore the Accumulator in the byte whose address is the numbers in $1A and $1B plus the Y register. Since neither $1A, $1B, nor the Y register has been changed since the byte was loaded, the contents of the accumulator are put back exactly as they were found, except that now the byte is exactly the opposite of what it originally was. What the remainder of this program does is change the pointers so that a new byte is loaded into the accumulator each time.

The main way of loading successive bytes is by incrementing (adding one to) the Y register, but this has a significant limitation: the largest number the Y register can hold is #$FF, and that is not nearly enough of an offset to access the entire hi-res page. The way to solve this, therefore, is to INCrement the beginning pointers ($1A and $1B) and keep the offset pointer (Y register) equal to zero. Here it is:

```
0310-   E6 1A      INC $1A
```

INC $1A means INCrement memory location $1A, so in our case $1A would change from zero to one. If we switch the order of $1A and $1B, we get the number $2001, which is the next byte of the hi-res screen and therefore the next byte we want to change.

```
0312-   D0 F6      BNE $030A
```

BNE $030A means Branch if the last arithmetic operation did Not Equal zero to the line which begins at $030A. You may wonder how adding to a positive number would ever result in zero. Just like the Y register, any memory location can hold a number only up to #$FF, and when #$01 is added to #$FF, the Apple automatically makes it a zero.

In our program, therefore, the beginning pointer history would look like this: $2000, $2001, $2002, . . . ,$20FF, $2000. This is not what we want, for you notice that in the end we begin to repeat, changing bytes that we already have changed, and we never get to any of the memory above $20FF. Therefore, BNE $030A means that if, when you add #$01 to $1A, you get a whole number, go to line number $030A. But if you get a zero, you drop down to the next line where the problem will be handled.

```
0314-   E6 1B       INC $1B
```

INC $1B means INCrement memory location $1B. In normal (base 10) arithmetic, if you add one to 99, you get

```
  99
+  1
 100
```

Our program is doing the same sort of thing, only it is in hexadecimal. F is the hexadecimal equivalent of 15, so it is the largest possible one-digit number in base 16, just as 9 is the largest possible one-digit number in base 10. Therefore:

```
     #$FF
+    #$01
    #$100
```

What INC $1B does is add one to the first half of the pointer whenever the second half has reached its limit. The last byte in which we want to switch the colors is $3FFF, the end of HGR, so now we will check to see if the next byte to be changed is $4000; and if it is, we want to stop.

```
0316-   A5 1B       LDA $1B
```

LDA $1B means LoaD the Accumulator with the number in memory location $1B. It does *not* mean Load the Accumulator with the actual number #$1B, and the difference is that the LDAs in lines $0300 and $0304 have number signs (#) before the numbers.

```
0318-   C9 40       CMP #$40
```

CMP #$40 means CoMPare the accumulator with the number #$40. To compare it, the Apple really subtracts #$40 from the accumulator. The answer is not stored anywhere, but certain flags are set that we can check to see what happened when the subtraction took place.

```
031A-   DO EE       BNE $030A
```

BNE #030A means Branch if the subtraction did Not Equal zero to the line at $030A. In almost all cases, the program at this point will go to $030A, but when $1B is equal to #$40, the entire hi-res screen will have been switched, and the program will drop down to the next line.

```
031C-   60          RTS
```

RTS means ReTurn from the Subroutine. This entire machine language program is really just a subroutine or a program within a program, so after this part is finished, we want to return to the other section. What will actually happen is that we will, in effect, jump back into the Basic program.

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Listing 2.

```
10  ONERR  GOTO 100
20 D$ =  CHR$ (4)
30  REM    ******************
31  REM    *                *
32  REM    * FARBE FLIPPER  *
33  REM    *                *
34  REM    *       BY       *
35  REM    *                *
36  REM    * STEVE PRESCOTT *
37  REM    *                *
38  REM    ******************
40 PG = 1
50  DATA      169,00,133,26,169,32, 133,27,160,00,177,
26,73,255,145,26,230,26,208,246,230,27,165,27,201,64,
208,238,96
60  FOR J = 768 TO 796
70  READ K: POKE J,K
80  NEXT J
90  POKE 1014,0: POKE 1015,3
100  TEXT : POKE 49236,0: HOME
110  PRINT  TAB( 15);"FARBE FLIPPER"
120  VTAB 10
130  PRINT  TAB( 5);"0) END": PRINT
140  NORMAL : IF PG = 1 THEN  INVERSE
150  PRINT  TAB( 5);"1) PAGE 1"
160  NORMAL : PRINT
170  IF PG = 2 THEN  INVERSE
180  PRINT  TAB( 5);"2) PAGE 2"
190  NORMAL : PRINT
200  PRINT  TAB( 5);"3) DISPLAY GRAPHICS SCREEN"
: PRINT
210  PRINT  TAB( 5);"4)DISPLAY & CHANGE GRAPHICS SCREEN"
220  PRINT : PRINT  TAB( 5);"5) LOAD A SCREEN"
230  PRINT : PRINT  TAB( 5);"6) SAVE THE SCREEN
240  PRINT : PRINT "---->";: GET CH$:CH =  VAL (CH$)
250  IF CH < 0 OR CH > 6 THEN 100
260  IF CH = 1 OR CH = 2 THEN PG = CH: GOTO 100
270  IF CH = 0 THEN  END
280  IF CH = 5 THEN 400
290  IF CH = 6 THEN 460
300  REM  DISPLAY SCREEN
310  POKE 49232,0: POKE 49234,0: POKE 49235 + PG,0:
POKE 49239,0
320  IF CH = 4 THEN 340
330  GET A$: GOTO 100
340  REM  CHANGE
350  FOR P = 1 TO 150: NEXT
360  IF PG = 1 THEN  POKE 773,32: POKE 793,64
370  IF PG = 2 THEN  POKE 773,64: POKE 793,96
380  &
390  GOTO 330
400  REM  LOAD A SCREEN
410  PRINT ""
420  PRINT D$;"CATALOG"
430  PRINT : INPUT "FILE: ";FILE$
440  PRINT D$;"BLOAD ";FILE$;",A$";2 * PG;"000"
450  GOTO 100
460  REM  SAVE SCREEN
470  PRINT : INPUT "FILENAME: ";FILE$
480  PRINT D$;"BSAVE ";FILE$;",A$";2 * PG;"000,
L$1FFF"
490  GOTO 100
```

So there it is—a brief, yet complete Apple machine language program that you can understand. You may wonder what the two-digit numbers are between the line numbers and the instructions: those are OP-codes, numbers that the Apple uses internally to store your program. To type in this program, it is actually easier to use these OP-codes. Just type:

```
]CALL -151
*300: A9 00 85...EE 60 (RETURN)
*(CONTROL-C)
```

You can actually type the entire program (all the OP-codes) in on one line, as long as you remember to leave one space between each two-digit number.

Back to Basic

The Basic program printed here is a short driver routine for the machine language subroutine we just analyzed and is divided into three main sections:

- A READ-DATA loop which POKEs the machine language program into memory.
- The menu or list of options
- The execution of the various options.

In line 50 you see a long string of numbers in a DATA statement. These numbers are the decimal (base 10) equivalents of the OP-codes that you used to type in the machine language program, and by READing them and POKEing them into memory, this Basic program writes the machine language subroutine for you.

If, for you own programs, you just want the machine language subroutine, you can merely type in lines 50-90, and the routine will be accessible with the ampersand (&). What line 90 does is tell the computer where to jump when you use the ampersand, and by POKEing 00 and 03 (0 and 3), you are telling the computer to go to $0300. (Yes, you must reserve them again.)

The next section of the program is the menu or list of options, and it is fairly self-explanatory. PG is a variable telling which page is presently being used. If PG=1, option one is printed in inverse, but if PG=2, option two is printed in inverse. Line 240 GETs your choice (CH$), and lines 250-290 analyze it.

The subroutine starting at line 300 displays the screen, and the series of POKEs in line 310 is a way of showing the hi-res screen without destroying the contents using the "soft-switches" described on page 13 of the Reference Manual.

Starting at line 340, the actual color changing takes place. Because the Apple has two hi-res graphics screens, Farbe Flipper must know which one you want to use. You may remember that in the beginning of the machine language subroutine we saved a #$20 for page one (the first hi-res screen); for page two the beginning is #$40, and we want to stop when the next byte will be $6000.

Lines 360 and 370 of the Basic program enter the correct values: if you are working on page one, the program POKEs in 32 (#$20 in hexadecimal) as the beginning address and 64 (#$40 in hexadecimal) as the ending address. If you are working on page two, the program POKEs in 64 and 96 (#$60 in hexadecimal). Line 380 may look strange, but this is what ties the machine language subroutine and the Basic program together. In a way, it is saying, "Okay, you know which screen we are using now, so go ahead and change the colors."

Now that you know how Farbe Flipper works, have fun with it, play with it, even change it if you want. To save the Basic program, type:

```
SAVE FARBE FLIPPER
```

and if you want to save the machine language subroutine separately (you don't have to), type:

```
BSAVE FARBE FLIPPER.CODE, A$300, L$1E
```

If you use another program that makes a neat picture, and you would like to change it, you can load Farbe Flipper without hurting either of the hi-res screens in any way. I have tried to make this program as compact as possible, but if you think you can improve it, go ahead. The best way to learn is by experimenting, and I would be happy to hear about how you changed and improved this printed version. □

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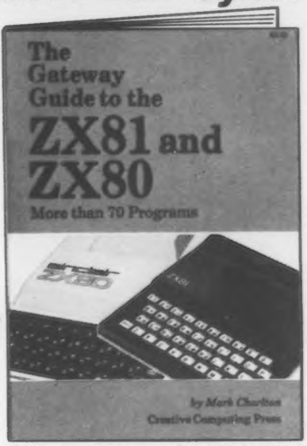
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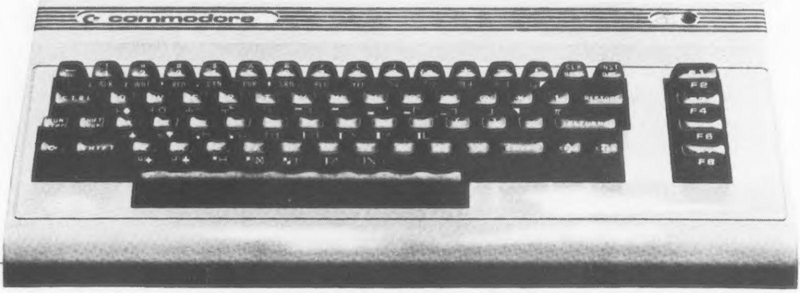

John J. Anderson

You may have noticed the new look of our Commodore column this month. Well Commodore itself has a new look, so its column should have a new look, and a new thrust, as well. Don't despair, Pet owners—much of the material that will appear in Commodore's Port will pertain to all Commodore computers, so don't feel left out. If you are a Vic 20 or Commodore 64 owner, rejoice and look forward to increased support for your machines in the pages of *Creative Computing.*

Riddle Me this

I have a riddle for you. Here's a hint: George Washington never slept in Sunnyvale. Question: What do Silicon Valley, CA and Valley Forge, PA have in common? Right: both are hubs of microcomputer manufacturing in this country. I recently visited Commodore, in Wayne, PA, to take a look around and talk about that company's plans for the future.

According to Neil Harris, in 1980, 10,000 Vic 20 units were sold nationwide. Toward the end of 1982, Commodore was manufacturing 10,000 Vic 20 units per day. And the new machine, the 64, is back-ordered in the tens of thousands of units. Commodore is taking some aggressive steps to meet this demand.

I toured their new plant in Westchester, PA, which has over 13 acres of space (see photos). Obviously Commodore is planning extensive product line expansion in the near future. With more than 600,000 square feet, the Westchester plant will not be outgrown for at least a little while.

This year will mark a significant milestone for Commodore, and they are quite proud of it. The capabilities of their latest machine, the Commodore 64, seem to bear out the company's most ambitious hopes for the future.

The 64 is truly an impressive machine. I have seen demo programs that come very close to cartoon-quality animation, straightforwardly written in Basic without any resort to esoteric machine code. That kind of potential warms my heart. If someone like *me* can get his hands on the animation and sound abilities of the 64, from Basic, and obtain dramatic results, then anybody can.

One exciting promise from Commodore for 1983 is a piano keyboard peripheral for the 64. This will allow for real-time programming of the sophisticated SID sound chip, using a very friendly input device. You must hear this chip to believe it—it sounds as good as many a dedicated music synthesizer. Together with the graphics magic of the machine, the SID chip shows a great deal of promise. I have not been as excited about a microcomputer since the Atari machine was introduced!

Disk Drive Rediscovered

Rarely, but much more often than I'd like, I hear criticisms along the following lines: the news we read in the pages of *Creative Computing* is all too rosy. How could it be that nearly every product we evaluate is so remarkable, useful, and/or enjoyable? People who voice this accusation have formed the opinion that we must be in cahoots with manufacturers, printing only good things about their products, in return for their advertising.

I laugh when I hear this kind of stuff, only because it is so far from the truth. Okay, most of the evaluations you see in the magazine *are* favorable—this is because we opt to give first coverage to products that truly deserve coverage. Not to say that the products we have not reviewed are uniformly disappointing, nor that all products we do cover are terrific.

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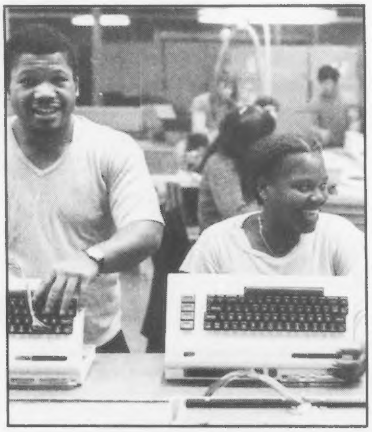

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Commodore's Port, continued...

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Character		How to get it on the keyboard	Program line(s)
♥	(inverse heart)	"shift" and "clear"	10, 250, 300, 350, 400, 450, 500, 550, 600, 670.
£	(inverse British "pound" sign)	"control" and "red"	262
R	(inverse R)	"control" and "9"	262, 276
_	(inverse underline)	"control" and "0"	262
←	(inverse left arrow)	"control" and "blue"	262
↑	(inverse up arrow)	"control" and "green"	276

Figure 1.

evaluate the objectivity of the utter lambasting I dealt to the Commodore Vic 1540 disk drive. This was a product I felt was of great importance, and to my horror, I discovered was quite a disappointment. Anybody who says we pull punches ought to take a close look at that piece, and then reappraise his outlook.

Now while we are on the topic of reappraising outlooks, I have some very good news to relate concerning the new Vic 1541 drive. Its makers have made a very successful attempt to redress the grievances I leveled at the 1540, and this pleases me to no end.

One of my strong objections concerned the manual, which easily qualified for the "Worst Documentation of the Year" award. Well I am sincerely happy to report that the documentation has been entirely rewritten, and is now suitable for reading by human beings. In fact, it has gone from one extreme to the other: it now stands as an example of how a manual can impart all needed information in a friendly, organized, and easily understood manner.

Transposition of I's with 1's and O's with 0's is now a thing of the past, while integral commas, missing in the earlier incarnation of the manual, have made a belated appearance.

Even more important, DOS wedges for the Vic and 64 are now included with every Vic 1541, providing a gamut of commands at your fingertips (see Figure 1). Thus tedious and cryptic coding of commands through Basic is eliminated. This was the central criticism I made of the 1540 unit. As a peripheral designed

Menu Program.

```
1 POKE 53281,1:REM THIS LINE FOR 64 VERSION ONLY
10 PRINT"♥"
20 PRINT" VIC-1540 USER'S MENU"
30 PRINT"----------------------"
40 PRINT
50 PRINT"  1. DISK DIRECTORY
60 PRINT"  2. FORMAT NEW DISK
70 PRINT"  3. INITIALIZE DISK
80 PRINT"  4. COPY FILE
90 PRINT"  5. RENAME FILE
100 PRINT"  6. ERASE FILE(S)
110 PRINT"  7. VALIDATE FILES"
120 PRINT"  8. WRITE MENU FILE"
130 PRINT"  9. ERROR STATUS"
140 PRINT" 10. EXIT TO BASIC"
150 PRINT
160 PRINT"----------------------"
170 PRINT" INPUT NUMBER OF YOUR":PRINT" CHOICE, HIT <RETURN>
180 PRINT
190 INPUT CHOICE
200 ON CHOICE GOSUB 250,300,350,400,450,500,550,600,650,700
210 GOTO 10
250 PRINT"♥"
251 OPEN 1,8,0,"$"
252 GET #1,A$,B$
254 GET #1,A$,B$
256 GET #1,A$,B$
258 C=0:IF A$<>""THEN C=ASC(A$)
260 IF B$<>""THEN C=C+ASC(B$)*256
262 PRINT"£R"MID$(STR$(C),2);TAB(3);"_←  ";
264 GET #1,B$:IF ST<>0THEN 282
266 IF B$<>CHR$(34)THEN 264
268 GET #1,B$:IF B$<>CHR$(34) THEN PRINTB$;:GOTO268
270 GET #1,B$:IF B$=CHR$(32) THEN 270
272 PRINTTAB(18);:C$=""
274 C$=C$+B$:GET #1,B$:IF B$<>""THEN 274
276 PRINT"R↑"LEFT$(C$,3)
280 IF ST=0 THEN 254
282 PRINT" BLOCKS FREE▓"
284 CLOSE 1:PRINT:PRINT:PRINT"HIT <RETURN> FOR MENU":INPUT X$:RETURN
300 PRINT"♥":PRINT:PRINT
305 PRINT"INSERT DISK TO BE":PRINT"FORMATTED.":PRINT
310 PRINT"INPUT DISK NAME" :INPUT DISK$
320 PRINT:PRINT "INPUT EXTENDER NAME":INPUT EXT$
325 MACRO$="N:"+DISK$+","+EXT$
330 OPEN 15,8,15,MACRO$
340 CLOSE 15:MACRO$="":RETURN
350 PRINT"♥":PRINT:PRINT
360 PRINT"INSERT DISK TO BE":PRINT"INITIALIZED.":PRINT
370 PRINT"HIT <RETURN> TO":PRINT"INITIALIZE":INPUT X$
380 OPEN 15,8,15,"I"
390 CLOSE 15:RETURN
400 PRINT"♥":PRINT:PRINT
410 PRINT"INPUT SOURCE FILE NAME" :INPUT DISK$
420 PRINT:PRINT "INPUT NEW FILE NAME":INPUT NWS$
425 MACRO$="C:"+NWS$+"="+DISK$
430 OPEN 15,8,15,MACRO$
440 CLOSE 15:MACRO$="":RETURN
450 PRINT"♥":PRINT:PRINT
460 PRINT"INPUT OLD FILE NAME" :INPUT DISK$
470 PRINT:PRINT "INPUT NEW FILE NAME":INPUT NWS$
475 MACRO$="R:"+NWS$+"="+DISK$
480 OPEN 15,8,15,MACRO$
490 CLOSE 15:MACRO$="":RETURN
500 PRINT"♥":PRINT:PRINT
510 PRINT"INPUT FILE NAME(S) TO":PRINT"DELETE":INPUT DISK$
520 PRINT:PRINT:PRINT"HIT <RETURN> TO DELETE":INPUT X$
530 MACRO$="S:"+DISK$
535 OPEN 15,8,15,MACRO$
540 CLOSE 15:MACRO$="":RETURN
550 PRINT"♥":PRINT:PRINT
560 PRINT"WARNING:OPEN FILES ":PRINT"WILL BE DELETED"
570 PRINT:PRINT:PRINT"HIT <RETURN> TO":PRINT"VALIDATE":INPUT X$
580 OPEN 1,8,15,"V"
590 CLOSE 1:RETURN
600 PRINT"♥":PRINT:PRINT
610 PRINT"INSERT DISK TO BE":PRINT"WRITTEN TO.":PRINT
620 PRINT:PRINT:PRINT"HIT <RETURN> TO WRITE":PRINT"MENU FILE":INPUT X$
625 OPEN 1,8,15
630 SAVE "MENU",8
635 CLOSE 1
640 RETURN
650 OPEN 1,8,15
660 INPUT#1,A,B$,C,D
670 PRINT"♥":PRINT:PRINT
680 PRINT"ERROR STATUS":PRINT:PRINT"ERROR # ";A:PRINT B$:PRINT"TRACK ";C,"SECTOR";D
685 PRINT: PRINT"0 = NO ERROR"
690 PRINT:PRINT:PRINT"HIT <RETURN> FOR MENU":INPUT X$:CLOSE 1:RETURN
700 PRINT"♥":PRINT:PRINT
710 PRINT"NOTE: MENU PROGRAM IS":PRINT"STILL RESIDENT."
720 END
```

to service the Vic 20, with its excellent reputation as a learning machine, the new drive now lives up to the aspirations of the computer for which it was designed, as well as the dramatic promise of the model 64.

The 1541 is the replacement drive for both machines, and the 1540 has already been phased out. Owners of 1540 units can purchase easy-to-install upgrade ROMs, to transform their machines into mechanical equivalents of the 1541. I have had very little trouble transferring Vic files to the 64, and vice versa. Though there are some differences in the way each machine handles the drive, these are easily surmounted.

Baby Driver Reborn

For owners of the 1540 who have not yet acquired the ROM upgrade or DOS wedge programs, we have reproduced here an improved menu program, similar to the one we printed with the original 1540 piece. The idea of the program is to dispose of cryptic command codes wherever possible, in favor of a menu-based "mini-DOS." It is much less powerful than the Commodore DOS wedge, and is written in Basic as opposed to machine language. But its utility cannot be discounted—it will certainly help until you obtain the hardware and software upgrade.

I said in the *Buyer's Guide* that " a few ROMs from now, working with the 1540 disk drive will probably be child's play." I was wrong on this score: true user-friendliness was only a single ROM away. ☐

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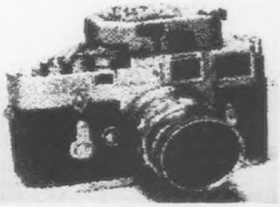

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Will Fastie

Having just finished Christmas and the New Year, I must say I enjoyed my holiday. I'm tired but relaxed. I received no toys for Christmas.

I had a birthday, too. No, I'm not going to tell you how old I am. I'm afraid my older readers would think I'm too young to know what I'm talking about, and my younger readers would think I'm too old to know what I'm talking about. I got one toy for my birthday, *Pitfall* for the Atari VCS. My son Josh bought it for me (I think). I haven't yet figured out how to plug it into the PC. Works fine on the VCS, though.

Last month I said I would consider working up the Basic interface to BIOS depending upon my state of mind through the holiday. My state of mind was not the best: Trudeau went into hibernation for a couple of years so no more "Doonesbury," and I was redecorating (a mild term to describe the work I did) the bathroom. I know that's all I need to say to gain your full sympathy.

Comdex

As part of my regular job I follow technology. That has not taken me to Comdex shows before, because I don't work for an "ISO," or Independent Sales Organization, the stated audience for all Comdex shows. This year, however, I expected considerable action in this arena and thought I might learn something of value for the company. Since I was there anyway, I assigned 10% of one eyeball to the IBM PC.

My expectation was accurate: the biggest Comdex ever—the exhibit area filled the cavernous Las Vegas Convention Center. In my two days on the floor, I was not able even to pass every booth, much less stop and chat. I think there were over 1000 exhibitors. I'll invest a week next year.

I thought there were three major areas of interest at the show from a purely general point of view. First, there were disk drive manufacturers all over the place. Most of the names were familiar, but there were some newcomers too. This business is really hot, but I think there has to be some fallout soon. Most of the booths seemed pretty dull, with little new or exciting, but with salespeople touting this increased capacity or that recording improvement.

I found the SyQuest booth the one exception (see my article in this issue). Second, the printer business looks like it is heating up. I was particularly impressed by Mannesman-Tally's model 160 printer, that firm's first entry at the low end. There were letter quality printers galore.

One product that excited me was the Datamarc 3000 single sheet feeder which costs about $1200, the least expensive I have ever seen. The unit appeared reliable and efficient, with features not available on any feeder I have examined. Finally, the number of software exhibitors was staggering. The big software attractions were the so-called "integrated" packages.

The biggest crowds were at software exhibits. There were many very interesting products, but the crowds seemed to converge on VisiCorp, MicroPro, and Ashton-Tate. VisiCorp was demonstrating both *VisiWord* and *Visi-on,* and the presentation of the latter was well-done. MicroPro was showing off *InfoStar,* their new information management package. *dBaseII* was generating tremendous interest at Ashton-Tate. Lesser, but still significant, gatherings could be seen at Lotus (*1-2-3*) and Sorcim (*SuperCalc, SuperWriter).*

The interest in hardware seemed to center on the IBM PC compatible portable computers. Those booths were crowded all the time.

When I got back, my boss asked me for reactions. I was a little slow, so he prompted me. Star of the show? I hesitated. Most significant product? Slow again. Technological advances? At least on that I had a quick no. That put me on the spot, so I had to explain that I saw very few things that pushed technology or represented breakthroughs. That is not to say that nothing was interesting or that nothing was learned, but the simple fact is that nothing I saw made my eyeballs pop out.

IBM at Comdex

IBM has a vigorous ISO program, so they were at the show in force. (Sorry, that's redundant. If IBM is anywhere, it is *always* in force.) The PC was not particularly emphasized, although 20% or so of the exhibit was devoted to it. What was interesting was the software they were showing.

Recently, IBM loaned some number of schools IBM PCs with some educational software. It was this software that was on display, along with some

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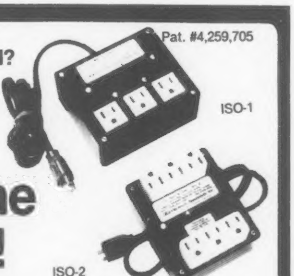

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mysterious-looking color display devices (IBM does not offer a color display). The whole thing was rather low-key.

While IBM may not have had the PC in force, everybody else did. Without a doubt, the PC was the most visible small computer at the show. Usually it was required to demonstrate PC compatible software or hardware, but it was also being used to demonstrate other products in situations in which any computer would have served.

What My Eyeball Saw

The 10% of my eyeball assigned to cover the PC got overworked, to say the least. I couldn't begin to describe all the products exhibited at the show, even if I could devote this entire issue to the task. The descriptions that follow are of some of the products that seem more significant or interesting to me.

In general, the PC was most visible demonstrating integrated software. "Integrated" is the new, great buzzword in the computer industry. It means that a program is capable of performing multiple kinds of work, and that it can do so on the same data set. For the IBM PC, a program called *The MBA* from Context Management Systems was the first product in this category. It can perform spreadsheet, database management, and word processing functions and can interchange data freely between its parts. There is no question that integration is necessary, but I think the jury is still out on some of these packages.

The five companies mentioned above, those attracting the crowds, were demonstrating their products on the IBM.

Local Area Networks

For a variety of reasons, I am interested in products that allow IBM Personal Computers to be clustered into small local area networks. I would also love to review these products, but it is hard to network the one computer in my basement. Hmmm, maybe I could cluster with my Atari VCS...

Three products exhibited at Comdex, and one that was announced there, have attracted my interest.

The flashiest exhibitor in this category was Novell Data Systems: the nature of their product was evident just by looking at the booth. Their ShareNet product allows connection of up to 24 computers to a network processor built around the Motorola 68000 processor. Data rates are 300K to 500K baud per station, which Novell translates into an aggregate of 12 megabits per second for the network—a little optimistic in my opinion. The network nodes can be as far as 3000 feet from the network processor. Up to five printers are controlled by the print spooler, a function of the network processor. Up to 120 megabytes of storage are supported. An electronic mail package is available. Novell claims that PC DOS, CP/M-86 and the p-System are supported for the PC, and that other computers (Apple, TRS-80, Displaywriter, CP/M and Unix systems) are also supported.

There is one thing I like about ShareNet and one thing I don't like. The good thing is that no local disk storage is required in the network. This means that the network nodes can be completely diskless and do all their filing on the central disks. I'm impressed, too, because I didn't think this could be done without a modification to the IBM ROM. The bad thing is that the network topology is the star, with the requirement that each PC on the net has its own wire leading directly to the network processor. One of the points of local networks in my mind is to have ring or hub topologies to reduce the wiring cost, not to mention the mess. If the network is small, say five or six stations, this won't matter much.

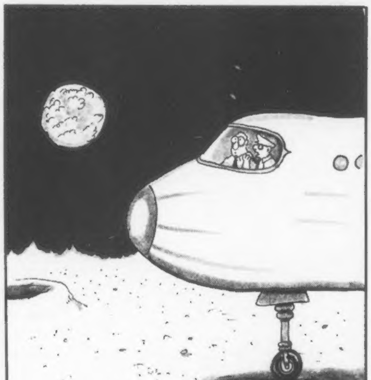
The Cadillac of network systems is Plan 4000 from Nestar. Plan is a new product, and takes Nestar from a strictly Apple domain into the IBM world, although Apple and IBM computers can be mixed on the same network. The hardware is not compatible with previous Nestar products, although software should port. Nestar has implemented Arcnet, a token passing, baseband network architecture pioneered by DataPoint. They have followed the ISO (in this case, International Standards Organization) seven-layer model, using layers one and two from Arcnet and layers three and four from the Ethernet standard. The aggregate transmission rate is 2.5 megabits per second, and up to 255 nodes can be supported. Any two stations can be up to four miles apart.

The network processor, called a file server, is very sophisticated and powerful. It supports up to 548Mb of storage, but multiple file servers can be placed on the same network for even greater capacities. Streaming tape drives provide system backup. The file server does not provide printer spooling services, although Nestar may add the feature at a later time. Instead, a dedicated PC on the network provides the function and becomes the print server. Other PCs can be configured as gateway servers: multiple Plan 4000 systems may be linked, remote terminals may gain access, and Nestar even offers a Telex server. Electronic mail software is available.

The announced product is from Davong Systems, and is an integration of the Nestar Plan 4000 system into a small scale network of from two to six PCs. Unlike the Nestar product, which requires independent servers, one IBM PC with a Davong hard disk would function as the file server but also operate as a work station. Multiple file servers would also be allowed. The system will use the Nestar Arcnet hardware and software as the basis for the network. Davong plans to offer the product for IBM, Apple II, and III, and Osborne I, and will support PC DOS, CP/M-86, and the p-System.

In an associated product announcement at Comdex, Davong introduced their universal hard disk drive, with capacities of 5, 10, or 15Mb, and both streaming tape and cartridge disk (SyQuest 306) backup subsystems. The product allows the same disk hardware to be used on IBM, Apple, or Osborne systems with the appropriate interface hardware, and allows expansion of the disk subsystem to 60Mb, the kind of capacity that might be required in a relatively small network. A dealer gains flexibility in that only one disk subsystem need be stocked or serviced, regardless of the target system. Even though the universal drive is an external device, Davong pricing continues to be aggressive at $1995 for 5Mb, $2495 for 10, and $2995 for 15. The cartridge disk can be added for $1495. Photo 1 shows the universal disk.

I am sure that the Davong pricing for the network system will be competitive, in their tradition, but at the moment the low cost network seems to be PCnet, from Orchid Technology. The equipment and software required to add one PC to the net costs $695, and Orchid offers a "starter kit," for $1490 which includes everything needed to get two PCs networked. The network uses baseband



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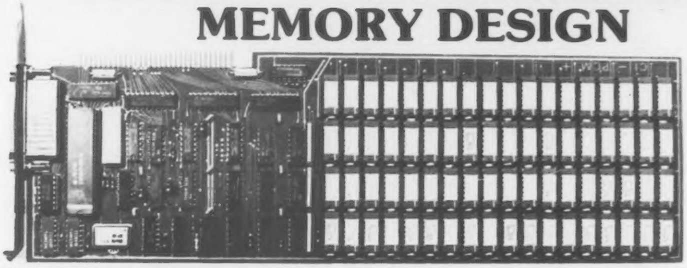

512KB SINGLE BOARD IBM MEMORY W/RS232-C PORT

- Addressable as a contiguous block in 64KB increments thru 1 megabyte.
- On board parity with interrupt on parity error.

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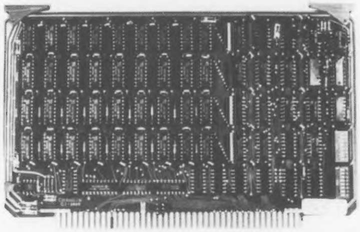
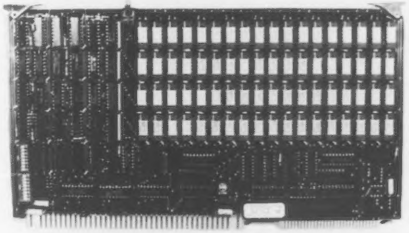
MEMDISK 1 Allows memory to emulate disks. Increases system performance!!



64KB SINGLE BOARD EXORCISOR 1, 11, AND ROCKWELL SYSTEMS 65 MEMORY

- Parity checker on board.
- Addressable as a contiguous block in 4K increments with respect to VXA or VUA.
- Pin to Pin compatibility.

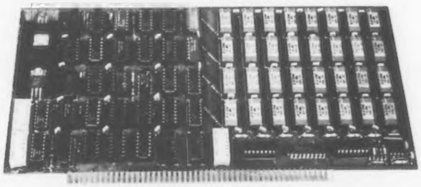
SINGLE QTY. PRICE: $390.00



512KB SINGLE BOARD MULTIBUS MEMORY

- Pin to Pin MULTIBUS compatibility for both 8 bit and 16 bit systems.
- On board parity with selectable interrupt on parity ERROR.
- Addressable as a contiguous block in 16K word increments up to 16 megabytes.

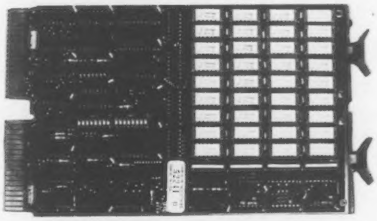
SINGLE QTY. PRICE: $1395.00



64KB SINGLE BOARD S100 MEMORY

- Addressable as a contiguous block in 4K word increments.
- Battery back-up capability.
- Functions with on-board refresh.

SINGLE QTY. PRICE: $390.00



256KB SINGLE BOARD LSI 11 MEMORY

- On board parity generator checker.
- Addressable as a contiguous block in 4K word increments through 4 megabytes.
- Battery back-up mode.

SINGLE QTY. PRICE: 128K x 18 $795.00
32K x 18 $390.00

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Multibus is a trademark of the Intal Corp. LSI II is a trademark of Digital Equipment Corp. EXORciser is a trademark of Motorola.

CIRCLE 134 ON READER SERVICE CARD

technology and offers a data transfer rate of 1 megabit per second.

The primary advantage of this product is that it supports hard disks from many vendors, and can thus be added even after a hard disk decision has been made. Orchid is not (yet?) a disk supplier, so they are probably a little more flexible. The software allows any PC to become a "resource server" and function as a work station at the same time. Electronic mail and print spooler software is available.

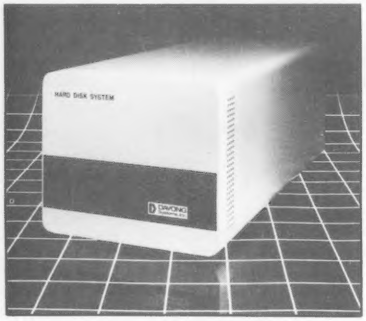

Photo 1.

I have no specific recommendation to make about these products, particularly because I have much yet to learn. However, it looks like Nestar has the most sophisticated product, a statement supported by Davong's selection of Plan 4000 for their own product. It might even be possible to inter-connect Nestar and Davong networks, an interesting and potentially useful concept.

Communications Products

A number of new communications products made their debut at Comdex. The most interesting was the *Professional Communication System* (PCS) from Microcom, a hardware device from a company previously known only for its software. The PCS 1200 and PCS 300, operating at 1200 and 300 baud respectively, are complete communications systems in a box controlled by a 2.5MHz Z80 processor. The device can include 16K or 64K of memory which can be used in various combinations to receive data, transmit data, or manage a print spooler buffer. Two RS-232 ports allow connection of a computer and a printer, for example, at the same time. The local interfaces operate at up to 9600 baud and support the XON/XOFF protocol. Telephone connection is made via modular phone jack.

The PCS supports auto-dial and auto-answer, tone or pulse dialing, half or full duplex operation, and a loop back test. A clock/calendar with a display is integrated into the unit, although I do not know whether the time and date can be accessed by the system. A NiCad battery provides 30 days of protection in case of power failure; the system normally requires house current (105 to 127 VAC). When the PCS is used in conjunction with another PCS modem or a computer running Microcom's *Micro-Courier* software, an error detection and correction protocol embedded in the PCS firmware provides error-free transmission. The device, pictured in Photo 2, is capable of handling communications chores by itself, without host control.

The reason I call your attention to this product is its great functionality, its ability to transmit both text and binary data, and its ability to operate a serial printer without adding a second asynchronous adapter to the IBM PC. A PCS 300 costs $595 with 16K RAM, $695 with 64K. The PCS 1200 prices are $995 and $1095, respectively.

A quick aside: I have been using the Hayes Smartmodem for about a year and it's great. The Microcom PCS seems like a "souped-up" Smartmodem, but it may also have greater complexity. The thing that makes the Hayes product so terrific is simplicity.

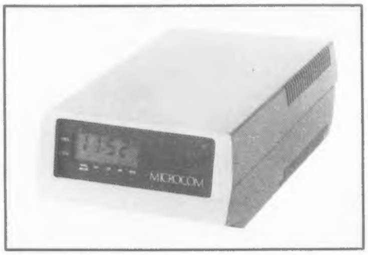

Photo 2.

There are several new products in the IBM 3270-compatible area. IBM announced such a product several months ago, but the third-party competition seems fierce. Given the huge number of 3270 terminal systems installed, it is not surprising. The general idea behind these products is the use of the IBM PC as a 3270 terminal. The two problems that have to be solved are the terminal emulation and the network connection.

I hope to try some of these products someday, but of course I don't have an IBM mainframe with 3270s in my basement. I won't attempt to pass judgment, but I note in passing from my reading of all the materials supplied by the vendors that the product from TAC seems the most straightforward. Careful: that's not a recommendation, only an observation.

IRMA is the Technical Analysis Corporation (TAC) product. It includes emulation software and a hardware device that allows the PC to be connected directly to most 3270 controllers. It costs $1195. AST Research, in conjunction with Communications Solutions, Inc., offers a 3270 SNA/SDLC interface for the IBM. The product allows a PC to emulate a 3274 cluster controller, and allows additional terminals or PCs to be supported by the emulating PC.

Persyst offers a slightly different product called the DCP/88 Distributed Communications Processor. The board has its own 8088 processor and up to 64K of memory. It supports two or four RS-232 ports in asynchronous or synchronous mode. IBM bisync, SDLC and HDLC are supported in synchronous mode. An optional printer interface, either Data Products or Centronics compatible, allows connection of printers with speeds up to 600 lines per minute. This sounds like a board to meet some pretty demanding communications requirements, but at the moment Persyst provides only an IBM bisync driver.

I'll include one other product in this category, although it is not strictly a communications device. It is called The Encryptor, from Jones Futurex, Inc. The device is available for the IBM PC, Apples, and S-100 systems. It uses the National Bureau of Standards' Data Encryption Standard (DES) to provide encryption and decryption functions. The press information was hard to make out, and I couldn't find the company on the floor at the show, but I deduce that the device is used under software control (software provided for PC DOS and CP/M-86) to encode a data file you wish to protect. The file can be protected locally, or transmitted to another computer for decryption. The hardware uses the Western Digital VLSI device, and the board is quite small. It will be interesting to learn whether the PC DOS version of the software insures that the clear version of the file on disk is actually erased: during a file transfer, the original file is left untouched, and deletion only causes the entry to be removed from the directory, not erased. For local protection, erasure would be essential.

Old Favorites

The coming of an IBM version of *Multi-Plan* from Microsoft, sold through IBM, no doubt provided some motivation to Sorcim and VisiCorp to upgrade their spreadsheet products. In addition, both companies introduced word processing products, while the expected announcement of *Multi-Word* from Microsoft did not materialize.

Sorcim introduced *SuperCalc²*, an advanced version of their successful spreadsheet offering. Frankly, I always thought *SuperCalc* was richer than *VisiCalc*, but Sorcim lists a long list of

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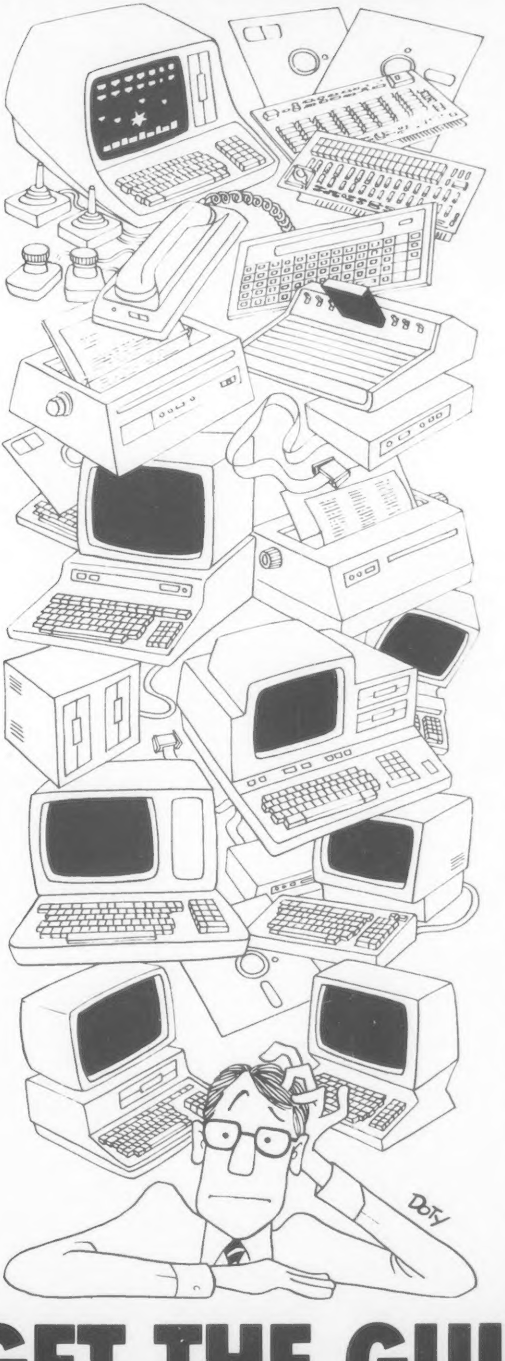

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features that are new, of which the most significant are consolidation and sorting. I think a particularly important feature is the fact that *SuperCalc* still operates in 64K of RAM on the PC, although I imagine the workspace has shrunk a little bit.

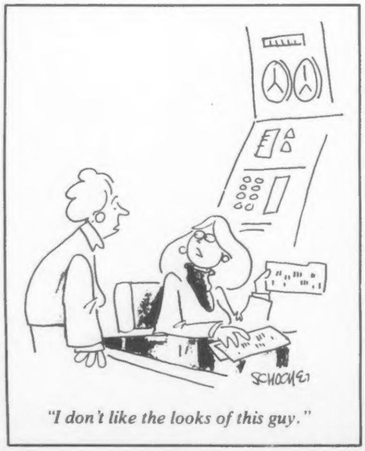
Advanced VisiCalc, introduced for the Apple III quite a while ago, is now also available for the IBM and DEC Personal Computers. The significant features here are variable column widths, online help, and consolidation. The program requires 128K of memory.

As for word processing, Sorcim introduced *SuperWriter*, while VisiCorp introduced *Visi-Word*. Lacking detailed information on both, I'll restrict my comments by saying only that both attempt to be user-friendly and both tout the support they provide for data interchange with their respective "calc" products.

Integrated Software Products

I wanted to spend some time with Context looking at the *MBA*, but either they weren't there or I didn't see them. Startup Lotus Development Corporation was there with a subdued but elegant booth and expensive-looking marketing materials. Their *1-2-3* package combines spreadsheet, graphic display, and information management functions in one program. Spreadsheet data can be quickly graphed (the color board is required for this) and data from the information manager can be integrated into spreadsheets. Each database can hold up to 2000 records, and a number of functions can be applied to select and sort the data records. Histograms can be developed from the data, and statistics (e.g. counts, sums, averages, variance, deviation) can be taken.

The Lotus literature sells the integration very hard, but it also sells two other things. The first is the spreadsheet portion itself, which Lotus claims is "the most comprehensive." The feature list seems to match those of *Advanced VisiCalc, SuperCalc*^{2}, and *Multi-Plan*, however, so that claim may be exaggerated. The second point is speed, emphasized over and over again in the literature. My observation at Comdex bears this out, but until I have tried it with large models or extensive data files, judgment will be withheld.



"I don't like the looks of this guy."

What impresses me most about Lotus, for the moment anyway, is the people. President Mitchell Kapor is the author of *VisiTrend* and *VisiPlot*, the sale of which netted a record of $1.2 million seed money for Lotus. Vern Raburn is the executive VP and general manager, and comes from a successful stint as a VP at Microsoft. Chris Morgan, vice-president in charge of communications, was previously editor-in-chief of *Byte* magazine. Not only that, but no less an industry guru than Ben Rosen, through Sevin-Rosen Investors, Ltd., is a principal investor and a director of Lotus. I just can't remember seeing a collection quite like that before.

I'll put two other products in the integrated category, even though they have the "visi-" kind of integration as opposed to Context or Lotus. The first is a set of programs from Perfect Software: *Perfect Writer, Speller, Filer*, and (can you guess?) *Calc*. The programs are advertised to have the same command language, and to allow easy interchange of data between modules. Perfect Software made a big splash by giving out free copies of their software at Comdex, with a retail value of $10 million, according to them. One was shoved (literally) into my hands, but unfortunately it turned out to be in 8" CP/M format. I'm on their list.

The other company is a new one, founded by Bruce McLoughlin (chairman) and Jim Edlin (president). Coincidentally, the company is named Bruce & James Program Publishers, Inc. The first product is *WordVision*, an IBM PC program that sells for $49.95. Breaking a long-standing tradition in the market, B & J software will name products with a *suffix*, "vision." Look for *FactVision, FileVision, ListVision, Math, Chart, Draw, Calc, Boss* (?!?), *Talk* (I thought sure this would be Tele), and *DeskVision*.

Kidding aside, the concept is interesting. As Jim put it, "We're going to get high quality software into users' hands on the installment plan." That explains the rock-bottom price. Bruce & James will sell "powerpacks" as add-ons to the basic program; in the case of *WordVision*, there will be a spelling program, thesaurus, style checker, letter writing aids, author's aids (footnotes and indexing, for example), and others. It appears that the user can buy what he needs while ignoring features and functions which aren't useful. Time will tell.

Odds and Ends

A few products also deserve mention, but don't fit in any of the categories mentioned above.

I want to mention Tecmar for two reasons. First, they have the SyQuest cartridge disk in a version that installs in the IBM system unit. $1795 gets you the disk, controller, and cartridge. The drive is also offered as part of their expansion chassis in a variety of configurations. That's the second reason for mentioning Tecmar. By Comdex, Tecmar had broadened their line of IBM PC products to 66, truly an incredible number.

What is important to note, however, is that Tecmar has products that nobody else seems to want to fool with. One vendor was telling me how a customer had asked for a communications adapter that would handle 16 asynchronous ports; the vendor directed the customer to Tecmar, because he figured if anybody had one, they would. (It turns out that they don't.) Tecmar is the only name in town for an expansion chassis, and they have the most complete line of equipment for scientific, industrial, and laboratory use.

Taurus Software announced *CP+*, a command language processor for CP/M, and in particular, for CP/M-86. Actually, the product is more a visual shell, providing a menu-driven way to perform most system functions without having to remember specific or complex command sequences. The Taurus example, and my favorite example too, is

```
A>pip B:FILENAME.TXT=
  A:FILENAME.TXT
```

which is pure junk. *CP+* allows the same function (copying a file from one disk drive to the other) to be accomplished by answering a series of questions YES or NO, and by using the cursor to point to file names. The program is scheduled for IBM DOS too, but don't hold your breath. If everything said about the next version of MS-DOS comes to pass, the visual shell will be an integral part of the operating environment.

The Sorbus Service Division of MAI now offers both on-site and carry-in repair service for IBM Personal Computers. They will also service configurations of the machine that include non-IBM hardware. Sorbus does not require a contract for over-the-counter service, billing on an incident basis, but offers competitive contract agreements for regular service. Sorbus has been servicing IBM mainframes for the past ten years, and has an established network of 160 service locations nationwide.

The last thing on my list is *Metafile.* Perhaps I should have talked about this product in the integrated software section, but the product is really an integrated software development tool. The brochure describes how *Metafile* goes beyond packages, beyond database, beyond prompting, beyond word processing.

The product is "a comprehensive system of facilities needed to handle diverse information," according to the press kit. The program can be used to prepare reports, menus, documents, data entry forms, letters, spreadsheets, and procedures. Data can be merged with text for reports or mailing lists. Spreadsheets can be linked to data files or other spreadsheets. Applications, from simple to complex, can be developed.

I don't really know how to describe the product, but I understand it quite well. In simple terms, I would call it a programming language, except that it is a total environment, not just a language. It is enormously powerful. What I can't decide, without some further investigation, is if the product is suitable only for software developers or if users can build applications with it. If the latter is the case, *Metafile* is a hot property.

You will see more from me on just about everything mentioned in this column. I hope the brief descriptions are of some value to you, and I encourage you to consider carefully your own requirements and examine these products in detail before making a buying decision. Good luck.

Next month, a tutorial on Basic program development tools, and the Basic to BIOS connection. ☐

Firms mentioned in this column:

SyQuest Technology
47923 Warm Springs Blvd.
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Nestar Systems, Incorporated
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Davong Systems, Inc.
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Novell Data Systems, Inc.
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Orchid Technology
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Metafile
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Taurus Software
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Tecmar
Personal Computer Products Division
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Cleveland, OH 44122
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Lotus Development Corporation
55 Wheeler St.
Cambridge, MA 02138
(617) 492-7171

VisiCorp
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(408) 946-9000

Sorcim Corporation
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San Jose, CA 95131
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Microcom, Inc.
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Jones Futurex, Inc.
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Fair Oaks, CA 95628
(916) 966-6836

Persyst
15801 Rockfield Blvd.
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Irvine, CA 92714
(714) 859-8871

Communications Solutions, Inc.
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San Jose, CA 95129
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AST Research, Inc.
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2691 Richter Ave.
Irvine, CA 92714
(714) 540-1333

Technical Analysis Corporation
120 West Wieuca Rd., N.E.
Atlanta, GA 30042
(800) 241-IRMA
(404) 252-1045

Mannesmann Tally
8301 South 180th St.
Kent, WA 98031
(206) 251-5552

MicroPro International Corporation
101 Lucas Valley Rd.
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(415) 499-9420

Ashton-Tate
9929 West Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570

Microsoft Corporation
10700 Northup Way
Bellevue, WA 98004
(206) 828-8080

Hayes Microcomputer Products
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(404) 449-8791

Context Management Systems
23864 Hawthorne Blvd.
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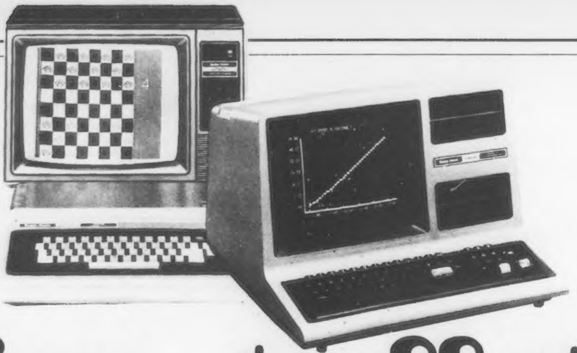
Torrance, CA 90505
(213) 378-8277



ings...trs-80 strings...trs-8

Stephen B. Gray

At the half-century mark, the fiftieth TRS-80 column contains only two items. The first is about telephones, modems, Videotex and information services; the second involves a programmable character generator.

Telephones

At the end of the March 1982 column appeared what had been quoted to me as Launegayer's Maxim, "All the world's an analog stage, and digital circuits play only bit parts." That's part joke, part truth. The natural world around us is entirely analog, including our voices, which create complex sinewave patterns that travel through the air as we speak.

The standard telephone is also an analog instrument, transmitting our voices as fluctuating electrical currents over wire. Although the telephone reproduces our voices fairly well, it is useless for transmitting high-speed digital signals accurately.

Why transmit digital signals over a telephone? If you have no intention of ever connecting your TRS-80 to the outside world, you can skip the next bunch of paragraphs. But if you want to subscribe to information services such as CompuServe, or communicate with other computers by sending and receiving data and programs, then you'll need to connect your TRS-80 to a telephone.

If you have ever heard music over the telephone, you know how "tinny" it sounds. Telephone circuits are designed to carry signals within the frequency range of the speaking voice, which is a fairly small range, from 300 to 3300 Hz. If music is transmitted over a standard telephone line, the highs and lows are attenuated, but you can usually still make out what is being played, because there is still enough content left to make the tune recognizable.

But if some bits are dropped from a digital signal that consists only of a string of ones and zeroes, what is left has no relation to the original. And that's why modems were born.

Modems

The word modem is short for modulator/demodulator, which means simply that it is a device that takes a digital signal, converts the electronic impulses into tones that can be sent over a standard telephone line, then translates the tones back into a digital signal at the receiving end.

Radio Shack has several modems. To use the $199 Telephone Interface II, which has an acoustic coupler, you dial the desired phone number, then place the handset of your telephone into the pair of rubber cups on top of the modem.

If your telephone is one of the modular types, plugged into the wall via a small plug about half an inch long, you can use either the $149 Direct-Connect Modem I, or the $249 Direct-Connect Modem II.

Modem I will handle most of your needs for letting your TRS-80 talk with other computers over the phone lines. Modem II (Figure 1) has Auto-Dial and Auto-Answer features, meaning it can automatically dial and answer the phone, receive and transmit data, and even hang up the phone. With a Modem II, you can connect to an unattached remote computer (which has to have been turned on, of course), and obtain data or programs from it.

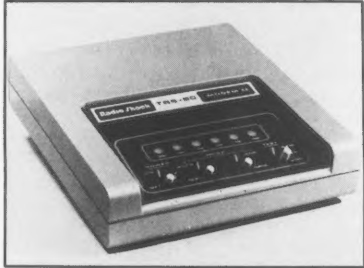


Figure 1. Radio Shack's Modem II contains a microprocessor and has many more features than Modem I, which has only one switch and two lights.

There is one more thing you need, along with a modem, for connecting to a distant computer via the telephone lines: software to turn your TRS-80 into a two-way information terminal.

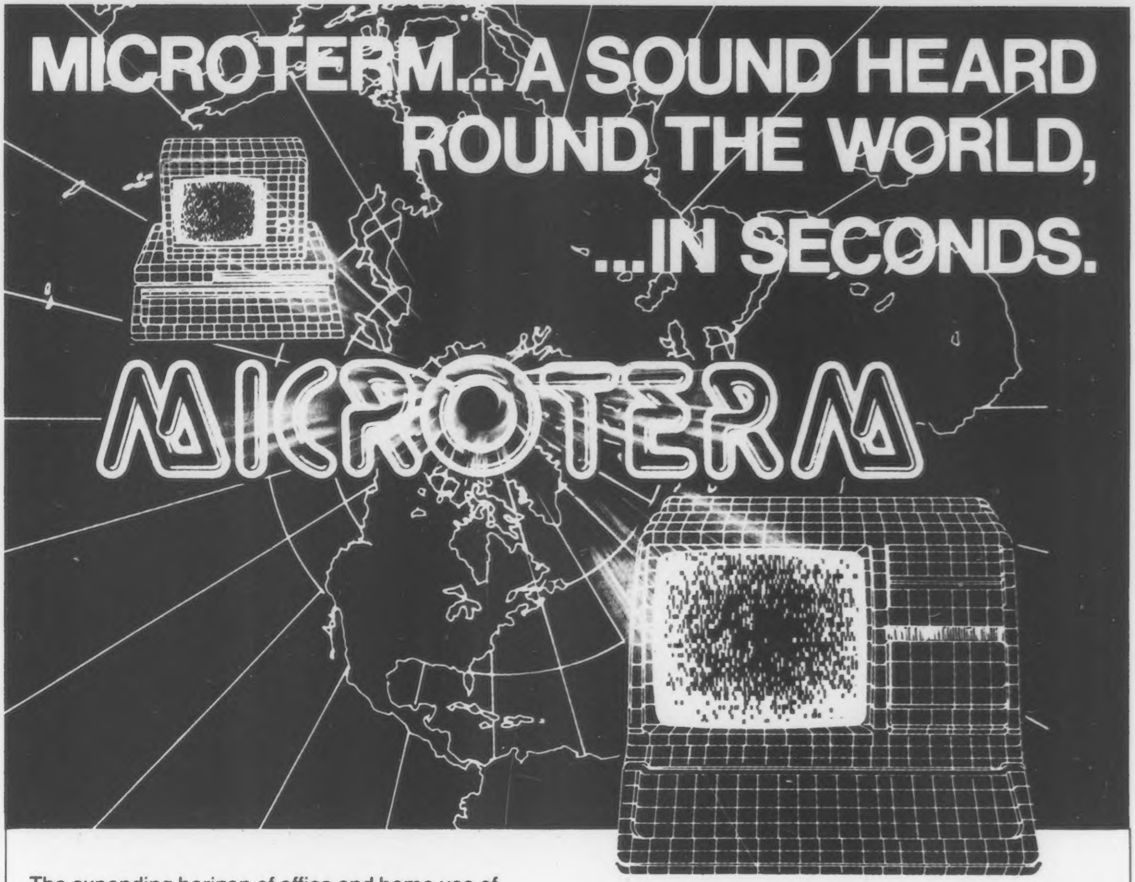
If you don't happen to have a TRS-80, you can buy Radio Shack's $399 TRS-80 Videotex Terminal, which is a variation on the Color Computer, with built-in terminal software and a telephone interface. Or you can get the $995 PT-210 Portable Data Terminal, which has a full keyboard, thermal printer, and acoustic coupler.

TRS-80 Videotex

If you already have a TRS-80 Model I, II or III, Color Computer, or even an Apple II or II+, Radio Shack has a $29.95 Videotex package that "allows access to major information databases using your computer and an optional-extra telephone interface," as the catalog puts it. Each package includes a cassette program in machine language that turns your TRS-80 into a smart terminal, a Videotex manual, CompuServe manual, ID number and password, and a Dow Jones manual and password. You get one free hour on each network. After that, the catalog notes, "you'll be billed at their low hourly rates."

The TRS-80 Videotex/Model I/III package has a very brief Videotex manual that says you'll need a telephone, TRS-80, RS-232C interface and connecting cable, modem, and cassette recorder.

First you connect all the hardware together. For Modem I, this consists of connecting the modem in parallel with your telephone, and the modem to the RS-232C cable.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MICROTERM

The expanding horizon of office and home use of new communications and data services tying smart terminals into networks through telecommunications links makes the world need a high speed terminal program.

Busy computers shouldn't have to wait for data simply because an old fashioned link can't handle today and tomorrow's telecommunications. Slow terminal telecommunications can stand the smart operator's world on its ear.

Into today's fast paced world, Micro Systems Software presents MicroTerm, the first truly high speed terminal for this inquisitive world. Some computers can run at up to 4800 baud null-free (9600 in some direct-connect applications).

MicroTerm enables you to do more in less time, in both ASCII and the new "error-free" direct file mode. Its unique Macro-Key function allows you to have 10 user-defined keys that transmit up to 64 characters at a single stroke. You can even dial a phone number and transmit the buffer at a specified time completely unattended by the operator.

And while MicroTerm improves your computer's "ears" by outperforming any other telecommunications terminal program, its low price won't take a bite from your bit budget. It's only $79.95 retail.

You can't lose with MicroTerm's features, performance, price, documentation, or support.

It's the only terminal program enabling you to continue operations in the command mode while receiving additional data through the RS232 cable. And you can adjust video width, turn on the printer, open the buffer and do many other things and then return to the terminal mode without missing a thing.

Available for the TRS-80 Models I, II, III, 16, IBM PC, Zenith Z-100, and Apple II computers.

If these advantages are what you want in your world, communicate with your nearest MicroTerm dealer. For information contact: Micro Systems Software, Inc., 4301-18 Oak Circle, Boca Raton, Florida 33431,
Telephone Toll Free: 1-800-327-8724
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CIRCLE 220 ON READER SERVICE CARD

Then you load the *Vidtex* program from tape. Using your telephone, you dial, for example, the local CompuServe number. When you hear the carrier tone, you flip the Mode switch on the modem from OFF to ORIGinate, and hang up the phone.

You soon get a display that asks for your

`User ID:`

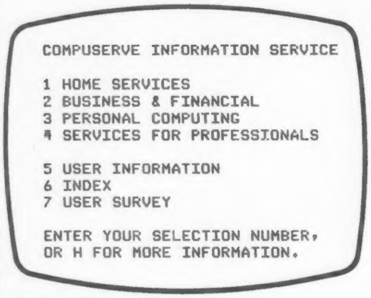
and you enter the CompuServe user identification number provided in the Videotex package. Next the display requests your

`Password:`

which is also provided in the package. But nothing shows on the screen as you key in your secret password. As the CompuServe instructions note, "For security purposes, your password is a nonprinting entry."

CompuServe

Once you give the correct user ID and password, the host computer congratulates you for selecting CompuServe. Several other messages follow, including information on how to sign up for continued use of CompuServe (which is part of H&R Block Inc.) after your free hour has been used up, and a brief listing of "What's new" on the service. Once all that is over, you get a display of the date and time and the screen appears as in Figure 2.



```
COMPUSERVE INFORMATION SERVICE

1 HOME SERVICES
2 BUSINESS & FINANCIAL
3 PERSONAL COMPUTING
4 SERVICES FOR PROFESSIONALS

5 USER INFORMATION
6 INDEX
7 USER SURVEY

ENTER YOUR SELECTION NUMBER,
OR H FOR MORE INFORMATION.
```

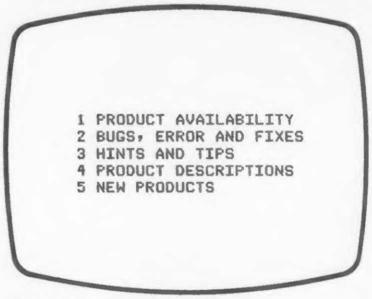
Figure 2.

If you enter 3, for example, you get another menu, with these selections: news, reference, communications, shop at home, groups and clubs, and programmer's area. Select the first item, and another menu pops up, asking if you want to look at one of five newsletters (Atari, RCA, Tandy, Microsoft, Commodore), the Micro Advisor, etc.

Select the Tandy newsletter, and you get a menu with entries such as Model I/III, Model II, Color Computer, Peripherals, Education, etc. Select that first item, and you get a menu with five choices as shown in Figure 3.

Ask for item 5, and you get a sixth menu, asking for which of several weeks you want the "new products received" information. Now you're getting down to brass tacks, after half a dozen menus and several feet of printer paper (if you've connected your printer to the hookup). So you pick one of the weeks, and you get the display shown in Figure 4.

All that work for two product names.



```
1 PRODUCT AVAILABILITY
2 BUGS, ERROR AND FIXES
3 HINTS AND TIPS
4 PRODUCT DESCRIPTIONS
5 NEW PRODUCTS
```

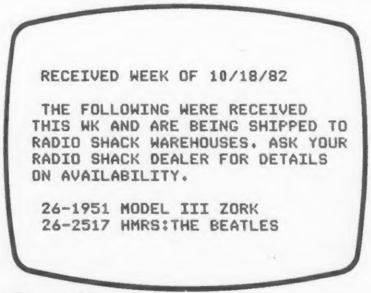
Figure 3.

But cheer up, there is all sorts of other information available, much of it in as much detail as you could want. At any time, you can key in M to get back to the previous menu, and branch out from there, or you can go directly to any menu on the CompuServe list, which includes several hundred subjects, such as *Washington Post,* Eliza program, trivia test, names of users, sports news, livestock prices, movie reviews, and many more, including languages such as Pascal and APL.

To go directly to the Pan Am menu, enter

`GO PAN`

and you're offered an index to countries, disease-infected areas, Department of State travel advisories, etc. Thus you'd be told to have your reservations confirmed well in advance if planning to visit Bahrain, because of several conferences being held there in the near future.



```
RECEIVED WEEK OF 10/18/82

THE FOLLOWING WERE RECEIVED
THIS WK AND ARE BEING SHIPPED TO
RADIO SHACK WAREHOUSES. ASK YOUR
RADIO SHACK DEALER FOR DETAILS
ON AVAILABILITY.

26-1951 MODEL III ZORK
26-2517 HMRS:THE BEATLES
```

Figure 4.

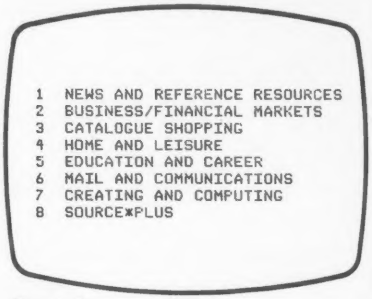
CB Radio Simulation

One of the most fascinating items on the CompuServe index is CB Radio Simulation. Ask for that, and you get a choice of tuning in on a "channel" or offering to "talk" one-on-one with anybody.

The display tells you there are, for example, four channels in use at the moment, with 13 users on channel 19 and five on channel 1. Select a channel, and you get into what I found to be the most boring conversations I have ever listened in on.

For example, you get yawners such as "how's things in Jersey City?" or "Nobody loves a lizard" or "I used to work in Forest Hills" or "Ohio State 45 Michigan 0." At $5 an hour, it's cheaper than a telephone call, but even less interesting than the average conference call. (That's $5 an hour evenings, weekends and holidays; $22.50 an hour at other times.)

So I said I would talk to anybody, and soon found myself chatting with a San Diego bank accountant, then a Xerox chemist in Rochester (who just happens to read this column), and later a computer science student at the University of Texas in Austin. For me, this was the most interesting item in the CompuServe index.



```
1  NEWS AND REFERENCE RESOURCES
2  BUSINESS/FINANCIAL MARKETS
3  CATALOGUE SHOPPING
4  HOME AND LEISURE
5  EDUCATION AND CAREER
6  MAIL AND COMMUNICATIONS
7  CREATING AND COMPUTING
8  SOURCE*PLUS
```

Figure 5.

Dow Jones

The Radio Shack Videotex package also includes "one hour of free introductory usage time in non-prime hours" on the Dow Jones Information Services. You can get financial news on a specific company, recent headlines on that company, current and historical stock quotes, detailed statistics, headlines of an industry, quotes on bonds, mutual funds or U.S. Treasury bonds and notes, etc.

The Source

To check out another information service, I got some free time on The Source, which turned out to be, for me, not as interesting or as easy to use as CompuServe.

For one thing, you can't offer to chat with just anybody; you must "enter the

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CIRCLE 216 ON READER SERVICE CARD

CHAT command followed by the account number of the person you wish to converse with." How can you tell whether he is on the system? Make a phone call and then switch to The Source?

Many users speak well of The Source, though, including some hotshot subscribers who write programs that analyze financial data, using information from the service's databases.

The Source (a service of Source Telecomputing Corp., owned by The Reader's Digest), offers "1,200 information and communication services." The main menu reads as in Figure 5.

The Source is $7.75 an hour (for 300-baud service) evenings, weekends, and holidays, $5.75 an hour from midnight to 7 a.m. daily, and $20.75 weekdays from 7 a.m. to 6 p.m.

The Source was described to me by another brief user as being not user-friendly, and I also found various problems. For example, when I selected the menu item, Micro News & Services, the response was "Sorry, temporarily under construction. Please check back later." And then I couldn't get back to the previous menu, no matter what I did. When I asked for HELP to get advice, I got instead, "Sorry, no help available at this time." I had to sign off and then sign back on to get out of that construction pit.

It took me a long time to figure out how to get into French Exercises, which asked for the word for "French" and when I replied "francais," insisted the correct word was "francaise."

Among the hundreds of Source services, I enjoyed the French Exercises (despite that little problem) and the New York Restaurant Guide. But when I tried to use the Calculator service, I was told "The CALC program is not ready for use yet. Get out your abacus!" So why was it on the menu? Then I tried IQ Test, which displayed the numbers 1 though 15 in a triangle arrangement, then said

```
    INPUT BLANK START
```

which I never did figure out, and thus got a very low IQ rating. At which point I entered

```
    BYE
```

and was disconnected.

80-Grafix III

One of the TRS-80 add-in high-resolution graphics boards mentioned previously is the Grafyx Solution (Oct. 1982, p. 286, and Jan. 1983, p. 332), from Micro-Labs.

Micro-Labs introduced 80-Grafix for the Model I in mid-1980 and now has a Model III version for creating game figures, symbols, alternate character sets, etc. Whereas Grafyx Solution provides the extra memory (12K bytes) for hi-res graphics, in which each point in a Model III 512-by-192-pixel display can be addressed individually, 80-Grafix is a programmable character generator with 2K bytes of RAM memory for storing up to 128 characters. This memory is bank-selected, so it doesn't use any of the TRS-80 memory or addressing space.

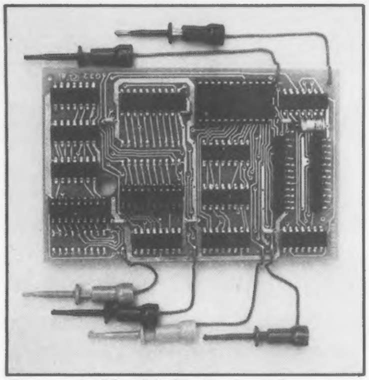


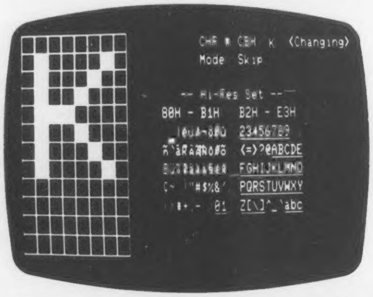
Figure 6. The 80-Grafix board connects to the main TRS-80 computerboard with six micro-clips, which hook onto IC pins, without requiring any soldering.

You can't install both Grafyx Solution and 80-Grafix in the same computer, because "they physically mount in the same location on the main computer board," according to a letter from Micro-Labs, which adds, "It would be possible to design a combined board but so far there has not been a significant demand for such a board."

Installing 80-Grafix

The 80-Grafix board is installed in much the same manner as the Grafyx Solution. The method for the Model III will be described here.

You open the Model III case (thus voiding the Radio Shack 90-day warranty), remove three ICs and plug them into the 80-Grafix board. Then cut one pin of another IC, bend it up, and cut two traces on the TRS-80 computer board.



```
              CHR # CBH  K  (Changing)
              Mode  Skip

              -- Hi-Res Set --
          80H - B1H   B2H - E3H
                      23456789
                      <=>?@ABCDE
                      FGHIJKLMNO
                      PQRSTUVWXY
                      Z[\]^_`abc
```

Figure 7. Screen display for the graphics editor, which can be used to change the shape of the stored K, or change it to some other character.

Install the 80-Grafix board and then fasten the six micro-clips (Figure 6) to the designated IC pins. At this point you can check out your work with the GTEST program, which verifies the memory locations of the new board. If they all check out, you next make a hacksaw cut in the previously removed metal RF shield, and bend part of it back so it doesn't touch the new board when reinstalled.

Operation of 80-Grafix

There are three basic modes of operation for 80-Grafix:

- Normal Display, in which standard TRS-80 characters are displayed as if 80-Grafix were not installed;
- Hi-Res, in which the programmed 80-Grafix characters are displayed in place of the normal graphics and Japanese or special characters; and
- Program/Read Mode, in which data can be read from, or written to, the 80-Grafix memory to create hi-res characters using 8 x 12 dot matrixes (Model I: 6 x 12 matrixes)—up to 128 of them.

Characters are created by translating the bit patterns of each horizontal line in the matrix into its decimal equivalent, and then putting the set of decimal "line values" into a DATA statement in a supplied program.

For example, the line at the top of the letter K in Figure 7 has the bit pattern

0 1 0 0 0 0 1 0

which translates to

0+64+0+0+0+0+2+0

or 66. The next line down in K has a decimal value of 68, and the third line, 72. The fourth line is 64+32+16, or 112. The bottom three lines repeat the top three, in reverse order.

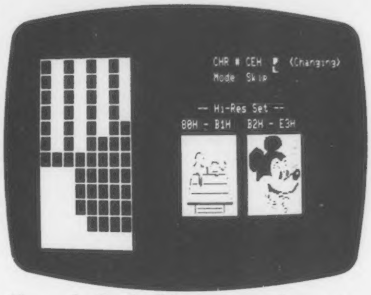
Thus the DATA line for generating a K is

```
DATA 66,68,72,112,72,68,66
```

which is POKEd into the 80-Grafix memory, from which it can be recalled to the screen when and where desired.

This is how you enter the data directly from a sketch of a character. Actually Figure 7 is a display of the graphics editor, which can be used to draw characters directly, in Etch-A-Sketch fashion (using the arrow keys and the enlarged grid shown in the figure), or to edit characters created either by the program described or by the editor itself.

The display shows how the new character looks in normal size, as you create or change it, and also displays the first 100 characters of the user's graphic set, arranged in two groups of 50 charac-



```
CHR # CEH  (Changing)
Mode  Skip

-- Hi-Res Set --
80H - B1H  B2H - E3H
```

Figure 8. Grafix-80 can create larger images by combining characters, such as these two sketches that encompass 50 character locations each.

ters, with five rows of ten each. "This arrangement," the manual says, "is useful for creating a large image which combines a number of characters as one image," as in Figure 8.

Among the many types of characters you can create are various patterns for graphs. Figure 9 shows how different types of shading can be used quite effectively in a bar graph.

Moving Graphics

An object can be made to appear to move horizontally across the screen, when actually only the bit pattern is shifted across several dot-matrix character "cells." You can write a subprogram for eight pairs of cells, in which an arrow, for example, shifts one column at a time to the left or right in each successive pair.

Then you display each pair of cells at the same screen location, in order, until all eight pairs have been displayed. You use the next screen position in the same fashion, until the object has "moved" across the entire season.

The same technique can be used to move objects in any direction on the screen. Incidentally, software that uses the normal graphics is not affected, because the hi-res graphics are disabled whenever the reset button is pressed.

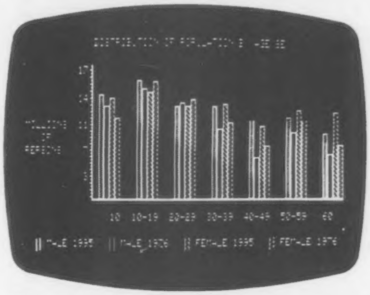


Figure 9. By using 80-Grafix to create various shadings for the bars, distinctive bar graphs can be drawn with a minimum of effort.

Grafix-80 Programs

Along with a 49-page manual, Grafix-80 comes with 20 support programs (on disk or cassette tape), with which characters can be created in Basic or machine language, and displayed with a PRINT or POKE statement. Five of the programs are demos, showing what Grafix-80 can do (create characters, move graphics, create a game, etc.), nine are utilities (hi-res graphics editor, memory check, load a character from disk or tape, convert hi-res files to ASCII files for merging with any Basic program), and six provide various character sets (duplicate of the normal graphics characters, inverse video of the alternate character set, etc.).

80-Grafix is $169.95 at selected dealers .or from Micro-Labs, Inc. (902 Pinecrest Dr., Richardson, TX 75080), postage-paid; specify disk or tape and Model I or III. The manual is available separately for $15. Several programs are available for use with 80-Grafix, such as *Space Colony* (a machine language game), *Character Sets* (provides some predefined character sets), *GPRINT* (for printouts), and *Games1* (four games). ☐

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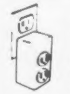

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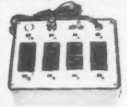

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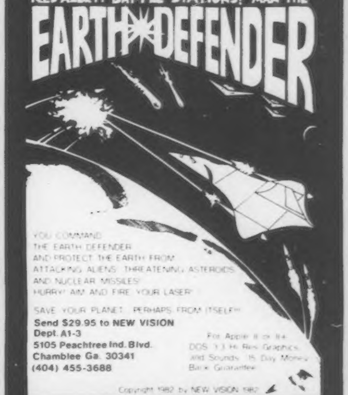

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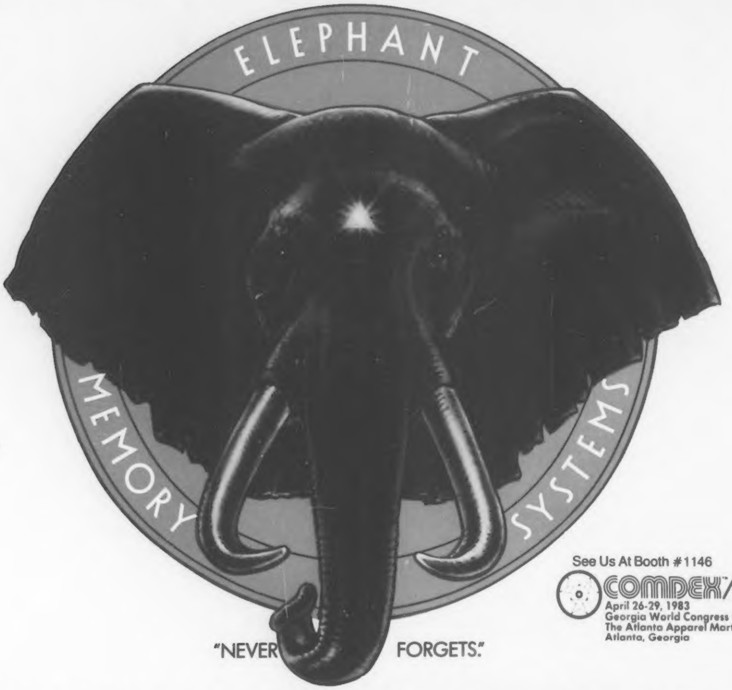

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